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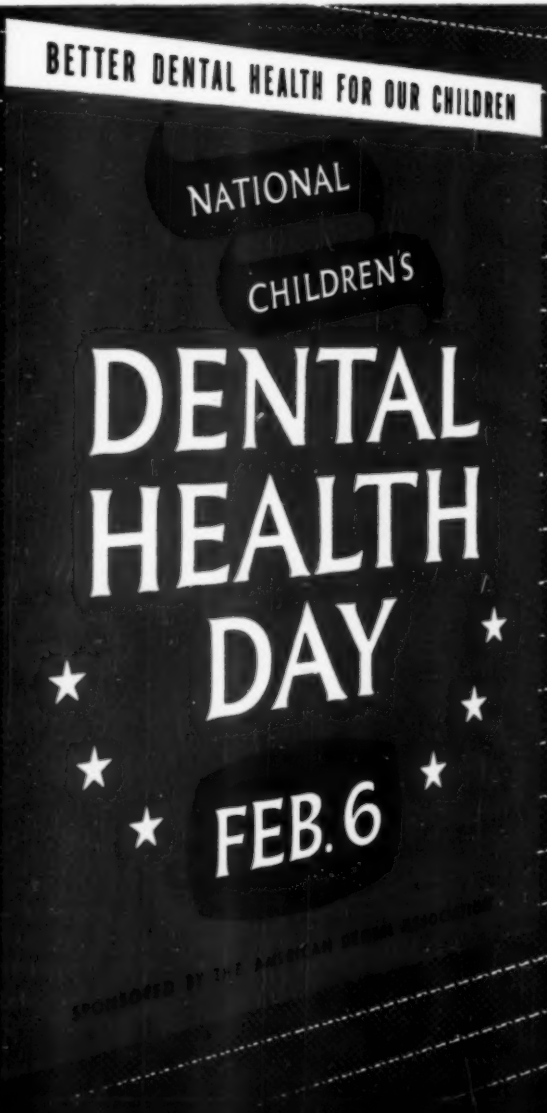
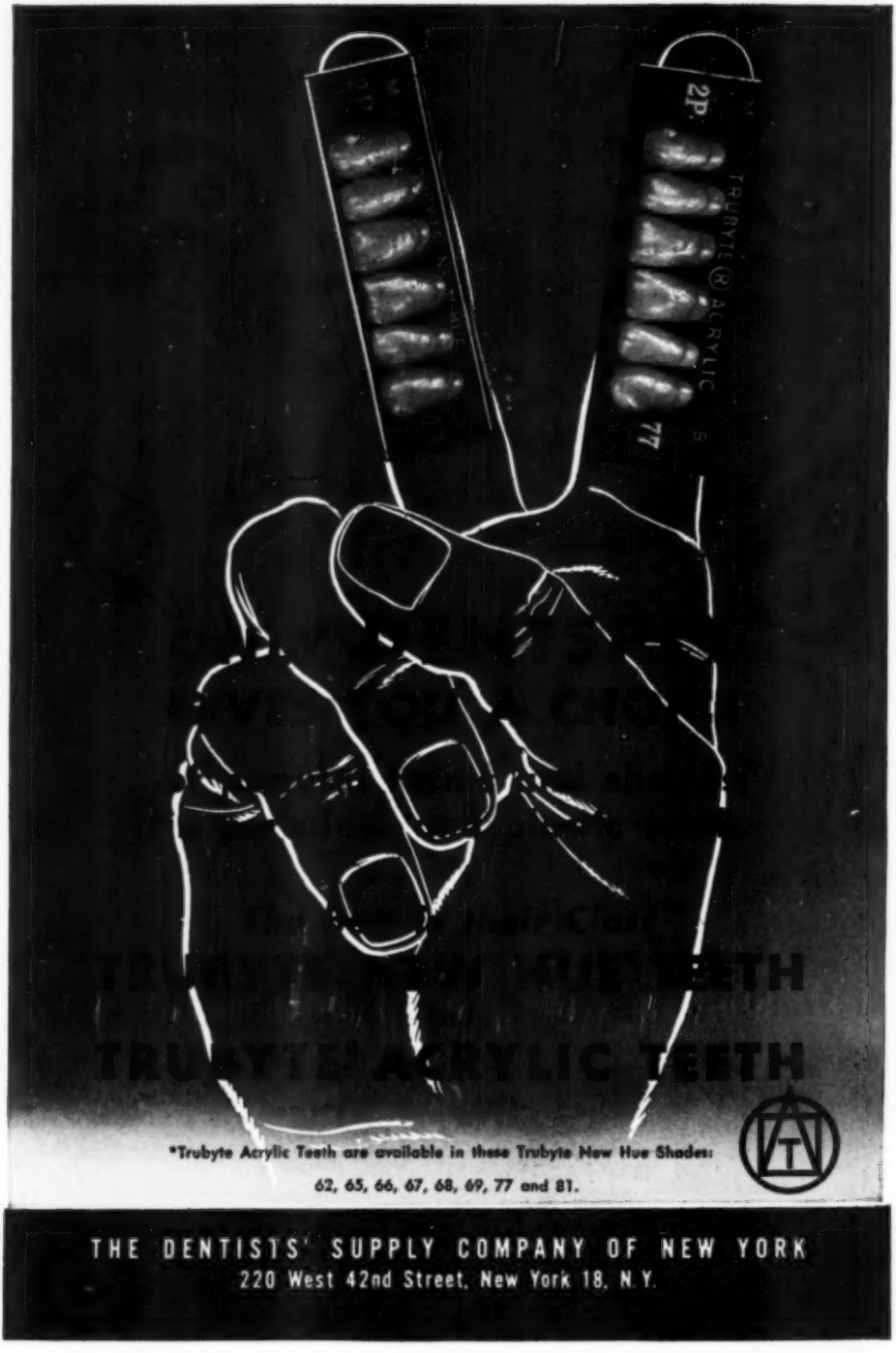
THE Journal OF THE
AMERICAN DENTAL ASSOCIATION

FEBRUARY 1950 • VOLUME 40 • NUMBER 2

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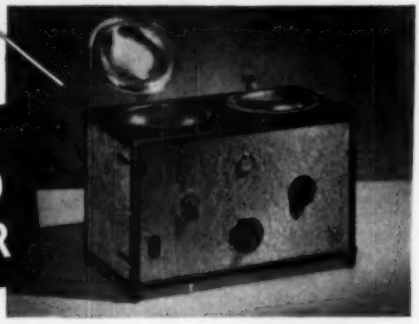

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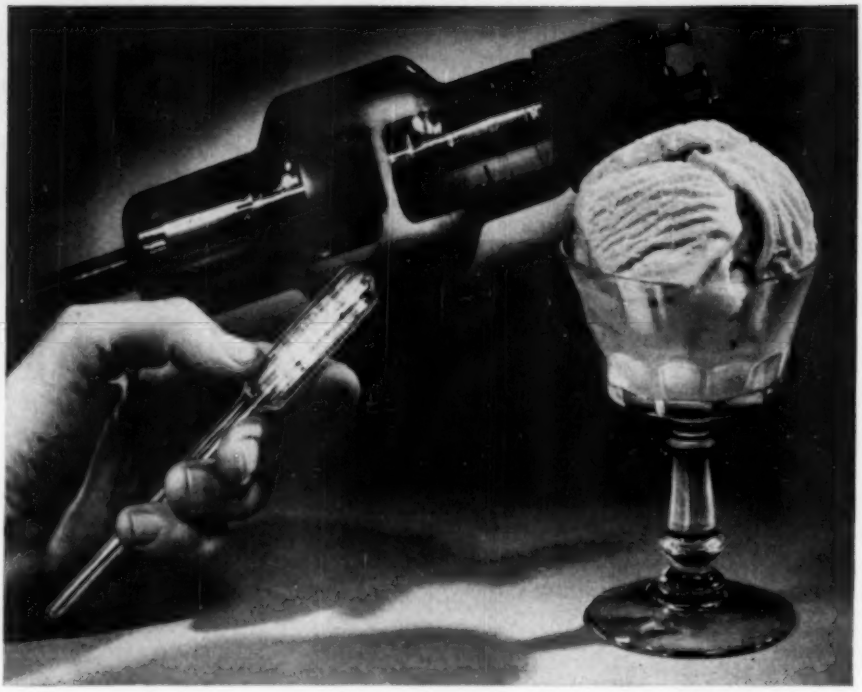

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*Henschel, A., Taylor, H. L., and Keys, A. *Some responses of man to internal thermal stimulation.* Fed. Proc. 8:73 (March) 1949.

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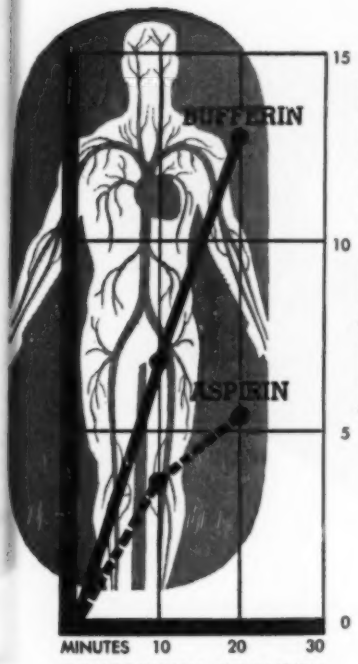

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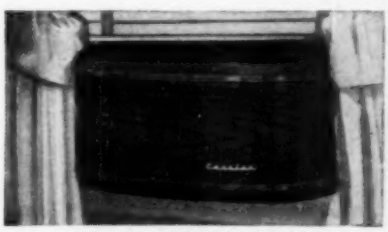

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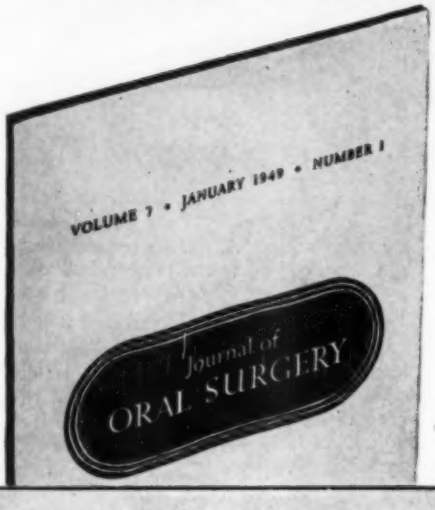

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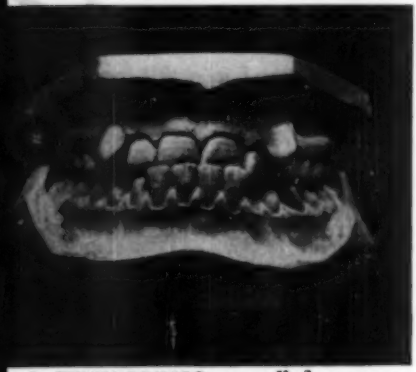

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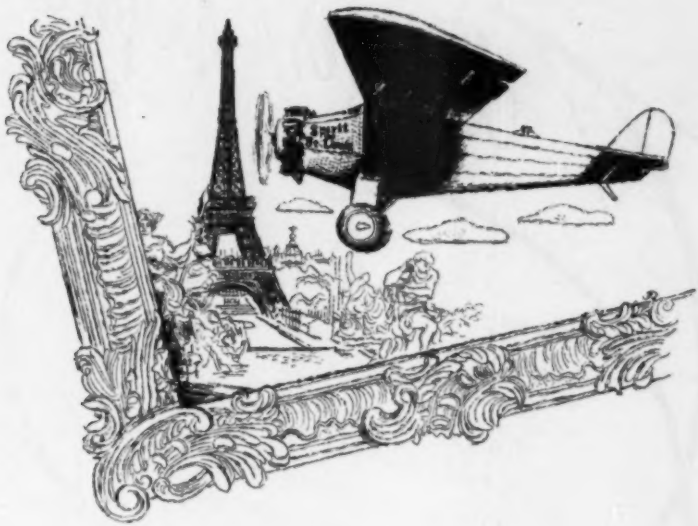

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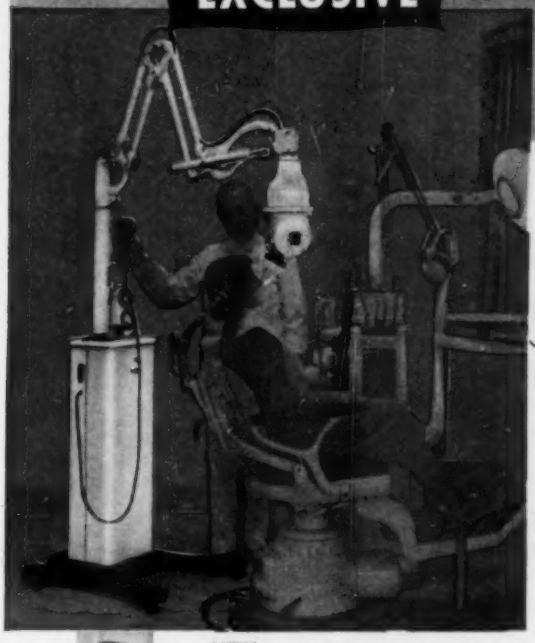

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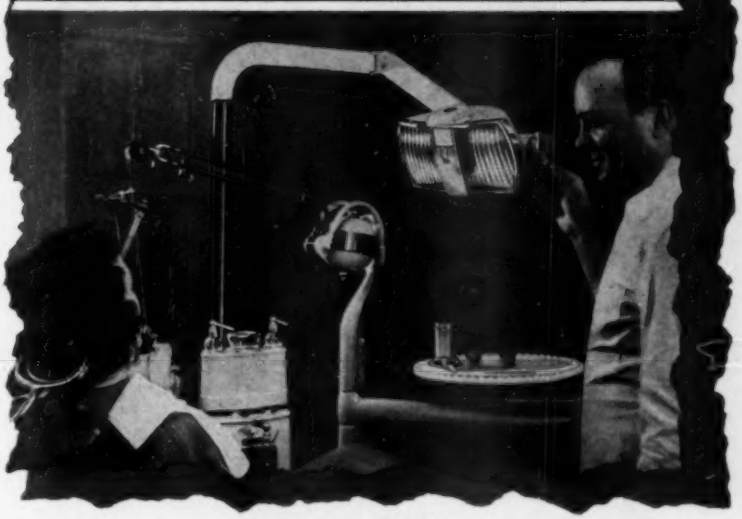

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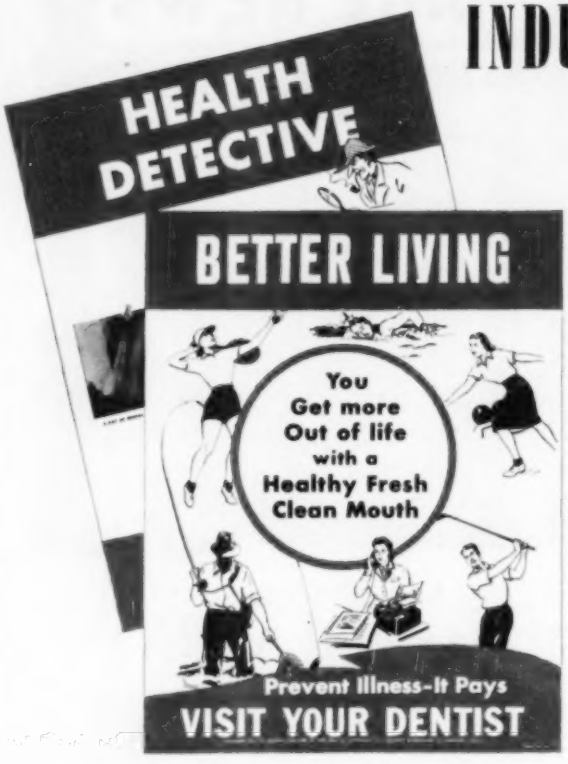
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FEBRUARY 1950 • VOLUME 40 • NUMBER 2

THE REDUCTION OF THE INCIDENCE OF DENTAL CARIES. I. IMMEDIATE TOOTH-BRUSHING WITH A NEUTRAL DENTIFRICE

L. S. Fosdick, Ph.D., Chicago

It is now generally believed by most dental research investigators that dental caries is initiated by an acid decalcification of the enamel surface under an organic coating or dental plaque.[1] Contrary to earlier concepts, it is now definitely known that the acids are for the most part formed very rapidly from fermentable carbohydrates by means of a well defined series of reactions which in turn are governed to a large extent by enzyme systems.[2,3] Furthermore, it is known that in caries-active mouths the acids are formed extremely fast.[4,5] In many mouths free acid, in sufficient concentration to decalcify the tooth, may be present on the enamel surface within three minutes after the ingestion of the fermentable sugar, but in most cases the maximum acidity on the tooth surface is present within about 20 minutes after the ingestion of sugar[6] and may persist for from 30 to 90 minutes. Thus, the actual carious process is not ordinarily a

This paper is the result of a cooperative effort on the part of the following investigators: A. P. Atkins, D.D.S., Research Associate, Northwestern University Dental School; D. Y. Burrill, D.D.S., M.S., Professor of Oral Diagnosis University of Louisville Dental School; J. H. Burrill, D.D.S., Assistant Professor of Oral Diagnosis, Northwestern University Dental School; R. R. Foster, D.D.S., Associate Professor of Radiology, Northwestern University Dental School; C. W. Freeman, D.D.S., M.S., Professor of Oral Surgery, Northwestern University Dental School; F. Garvin, D.D.S., Assistant in Research, Emory University Dental School; O. E. Hoffman, D.D.S., M.P.H., Director of Dental Health, Iowa State Health Department; F. C. Jefferies, D.D.S., M.S.D., Research Associate, Northwestern University Dental School; V. Johnson, D.D.S., Professor of Pedodontia, Emory University Dental School; W. Wolf, D.D.S., Assistant Professor of Oral Medicine, University of Louisville Dental School.

This work was supported by grants from The Colgate-Palmolive-Peet Company.

Professor of Chemistry, Northwestern University Dental School.

1. Easlik, K. A., *Dental Caries*. St. Louis, C. V. Mosby Co., 1948.

2. Fosdick, L. S., & Hansen, H. L., Theoretical Considerations of Carbohydrate Degradation in Relation to Dental Caries (Diet; Saliva.). *J.A.D.A.* 23:401 (March) 1936.

3. Fosdick, L. S., Carbohydrate Degradation by Mouth Organisms. I. *J.A.D.A.* 26: 415 (March) 1939.

4. Stephan, R. M., Hydrogen Ion Concentration of the Dental Plaque. *J. D. Res.* 17:251 (June) 1938.

5. Stephan, R. M., Changes in Hydrogen-Ion Concentration on Tooth Surfaces and in Carious Lesions. *J.A.D.A.* 27:718 (May) 1940.

6. Fosdick, L. S., Campaigne, E. E. and Fancher, O., Rate of Acid Formation in Carious Areas: the Etiology of Dental Caries. *Illinois D. J.* 10:85 (March) 1941.

long continuous process, but is an intermittent one, and consists of a series of short periods of decalcification, interspersed with periods in which no decalcification occurs but putrefaction may take place.

Concurrently with the formation of acid, there is a degree of defense against the acids in each mouth.[7] A large number of variables, many of which are present in most mouths, combine to render the acid harmless or to prevent its formation. The degree of protection in the population of so-called "civilized" countries is ordinarily not sufficient, so that most people suffer, to a greater or lesser degree, the ravages of dental caries. This is probably due to an increased rate of acid production in most cases, rather than to a decreased amount of protection. The reason is obvious in many instances, but there are still many factors that require further investigation.

On the basis of the above, whether or not all of the variables are thoroughly understood or known, there are several ways by which dental caries may be prevented. Many of these have been tried, either clinically or by means of laboratory experimentation, so is it now quite clear what must be done in order to prevent this important disease.[7] Since the acids are derived from fermentable sugar by enzymic action, it is obvious that by eliminating the sugars or by inactivating one or more of the enzymes, dental caries could be prevented. On the other hand, if the acids could be destroyed or rendered innocuous, either by neutralizing or otherwise removing them, or if the tooth could be rendered less soluble, caries could also be prevented. It has been shown beyond all reasonable doubt that the elimination of the substrate by dietary means is effective,[8, 9, 10] but only in cases where sugars are actually unavailable is this method generally successful. Numerous examples of enzyme inhibitors such as fluorides[11, 12, 13] Zephiran, [14] vitamin K,[15] ammonia[16] and urea,[17, 18] have been used experimentally with varying degrees of success. Rendering the tooth more resistant to acids (for instance by the use of fluorides,[11, 12, 13]) has also been successful. Thus it would seem that, from a practical and theoretical point of view, any method that performs any of the necessary functions of preventing the formation, or which rapidly neutralizes or destroys the acids, should prevent dental caries provided practical methods of application could be found.

One method of caries control that has been suggested frequently but has never adequately been tried experimentally[19] is that of simple oral hygiene procedures. If the maximum acid potential is reached about 20 minutes after the ingestion of sugars, a thorough cleansing of these substrates from the mouth, along with

7. Fosdick, L. S., Correlation of Some Facts Concerning the Aetiology and Control of Dental Caries. *J. Canad. D. A.* 9:359 (Aug.) 1943.

8. Jay, P., The Role of Sugar in the Etiology of Dental Caries. *J.A.D.A.* 27:393 (March) 1940.

9. Jay, P., Reduction of Oral Lactobacillus Acidophilus Counts by the Periodic Restriction of Carbohydrate. *Am. J. Orthodont. & Oral Surg.* 33 (Sect. on Oral Surg.):162, 1947.

10. Becks, H., Jensen, A. L. & Millarr, C. B., Rampant Dental Caries: Prevention and Prognosis. *J.A.D.A.* 31:1189 (Sept) 1944.

11. Knutson, J. W., and Armstrong, W. D., Effect of Topically Applied Sodium Fluoride on Dental Caries Experience: Report of Findings for Second Study Year., *Pub. Health Rep.* 60:1085 (Sept. 14) 1945.

12. Knutson, J. W., and Armstrong, W. D., Effect of Topically Applied Sodium Fluoride on Dental Caries Experience: Report of Findings for Third Study Year. *Pub. Health Rep.* 61:1683 (Nov. 22) 1946.

13. Knutson, J. W., Armstrong, W. D., and Feldman, F. M., Effect of Topically Applied Sodium Fluoride on Dental Caries Experience: Report of Findings with 2, 4, and 6 Applications. *Pub. Health Rep.* 62:425 (March 21) 1947.

14. Stephan, R. M., and Miller, B. F., Effect of Synthetic Detergents on pH Changes in Dental Plaques. *J. D. Res.* 22:53 (Feb.) 1943.

15. Burrill, D. Y., Calandra, J. C., Tilden, E. B., and Fosdick, L. S., Effect of 2-methyl-1, 4-naphthoquinone on the Incidence of Dental Caries. *J. D. Res.* 24:273, 1945.

16. Kesel, R. G., O'Donnell, J. F., Kirch, E. R., and Wach, E. C., Ammonia Production in the Oral Cavity and the Use of Ammonium Salts for the Control of Dental Caries. *Am. J. Orthodont. & Oral Surg.* 33 (Sect. on Oral Surg.):80, 1947.

17. Stephan, R. M., Effect of Urea in Counteracting the Influence of Carbohydrates on the pH of Dental Plaques. *J. D. Res.* 22:63 (Feb.) 1943.

18. Wach, E. C., O'Donnell, J. F., and Hine, M. K., Effects of a Mouth Rinse on Oral Acidogenic Bacteria. *J.A.D.A.* 29:61 (Jan.) 1942.

19. Fosdick, L. S., Etiology and Control of Dental Caries. *J.A.D.A.* 29:2132 (Dec.) 1942.

any acids formed within this interval of time, should prevent the initiation and progress of a carious lesion. There are several recognized methods by which this could be accomplished. A water or antiseptic rinse could be employed. This procedure probably would not remove much of the occluded debris or plaque material but, since the fermentable sugars are water soluble, it could conceivably dissolve and flush from the mouth much of the acids and fermentable sugars. There is little information available regarding the effectiveness of a rinse of the above type in removing sugars or acids from the mouth.

Another possible method — and one that is in general use for cleansing the mouth—is brushing the teeth. Although this procedure, with a suitable dentifrice, has long been advocated as a measure of general oral hygiene and has been practiced for generations, there are no reliable statistics regarding its effect on dental caries or its efficacy in cleansing the mouth. It is generally considered a good practice for reasons other than caries prevention. The usual routine has been to brush the teeth in the morning on arising and just before retiring. Theoretically, if the tooth-brushing procedure is to be effective in the control of dental caries, it must be performed immediately after each ingestion of sugar-containing foods. During the past few years this practice has been advocated intensely by dentists and research workers familiar with the carious process.[1, 20]

Although it is generally conceded that, if all sugars and acids were to be cleansed from the mouth before decalcification could occur, the incidence of caries would be reduced, there is little information concerning the efficiency of brushing in cleansing the teeth. A recent investigation[21] indicates that about 80 per cent of the debris can be removed by this process, but whether it can be removed before the acids can form and attack the enamel is problematical. For this reason, a comprehensive clinical experiment was started to determine the effect of proper brushing of teeth.

A great deal has been written on the proper type of dentifrice for the most efficient cleansing of the teeth. Some individuals feel that an antiseptic dentifrice should offer advantages over a nonantiseptic dentifrice, others that an antiseptic offers no advantage. Still others feel that a neutral or slightly acid dentifrice has superior cleansing effects to those of an alkaline dentifrice. Some argue in favor of a powder and some in favor of a paste. Others say that any dentifrice is simply a pleasant adjunct to an otherwise unpleasant task, and that a dentifrice serves no other purpose. The preponderance of evidence, however, indicates that an abrasive substance is necessary for proper cleansing. Because of financial limitations, it was impossible to test all types of dentifrices. Since tooth pastes are more widely used than powders, it was decided to use paste only. In this experiment an essentially neutral paste, an alkaline paste, and an antiseptic paste were investigated. The neutral paste consisted of dicalcium phosphate as the abrasive; glycerol; gums; flavor; a sulfated glyceride of coconut oil fatty acids as the detergent, and water. The antiseptic paste was identical with the neutral paste except that it had an efficient acridine derivative antiseptic present, and the alkaline paste was the usual precipitated chalk, soap type paste. This paper deals with the neutral paste only. The results of the other groups will not be available until a later date.

Experimental Procedure

A total of 946 individuals comprising 423 controls and 523 test subjects com-

20. Dental Caries: Prevention & Control (pamphlet), Chicago, American Dental Association.

21. Ludwick, W. E. and Fosdick, L. S., The Ammonium Ion Concentration in Dental Plaques. *J. D. Res.* In publication.

pleted the experiment. They comprised groups of liberal arts students from Drake University, Simpson College, and Emory University; the dental students of the University of Louisville, Emory University and Northwestern University, and the medical students of the University of Louisville. The groups were similar as far as possible in regard to oral conditions, age and sex. The average age of the test group was 22.7 and of the control group 23.5 years. Although there was a preponderance of males in both groups, the ratio of males to females was comparable.

All of those in the experimental group were instructed individually to brush their teeth thoroughly within 10 minutes after each ingestion of food or sweets, and when brushing was impossible to rinse the mouth thoroughly with water. They were instructed to brush their teeth with an accepted technic and to rinse the dentifrice from the mouth immediately after brushing. They were instructed to report the approximate number of times the brushing technic was omitted per day and, if they did not follow the technic after at least two meals per day continuously they were dropped from the experiment. Toothbrushes and dentifrice were supplied to all experimental subjects. Brushes were of a good quality and a standard pattern with twelve separated tufts of nylon bristle in two rows with the ends of the tufts cut wedge-shape.

The persons in the control groups were not supplied with dentifrices or brushes and were instructed to continue with their customary oral hygiene habits. The oral hygiene habits of all subjects except those in one group were determined and recorded. If the individuals brushed their teeth immediately after the ingestion of food, they were dropped from the experiment. In general, however, the oral hygiene habits of the control group were about the same as those of the test subjects previous to the experiment. Most of them ordinarily brushed their teeth only on arising and before retiring rather than after the ingestion of food. Only in exceptional cases were the teeth brushed only once per day or not at all. In general, the customary habit was to rinse the mouth free from dentifrice after brushing the teeth.

At the beginning of the experiment the teeth of each subject, in both experimental and control groups, were carefully examined by means of a mouth mirror, explorers, dental floss, and air syringe. Full mouth view and crown view roentgenograms were made for each experimental and control subject, with the exception of those from Simpson College and Drake University for whom crown view roentgenograms only were made. The roentgenograms were carefully examined by the original investigator with the aid of a magnifying glass and illuminator. After the original investigator had examined the roentgenogram and recorded his findings, the films were forwarded to a central office where another examination was made. Each roentgenogram was examined independently by two individuals, one of whom examined each of the roentgenograms of the entire test and control subjects. In cases where the two did not agree, the discrepancies were discussed with the two examiners and a conclusion reached. In case agreement was impossible, the area was omitted from the experiment. In the case of two groups, with the original investigator's consent, the discrepancies were judged by the second examiner and a third party.

At the end of one year and at the end of two years, the entire procedure was repeated. One control group, particularly the medical students, and a number of individuals in both groups, missed the examination at the end of the first year. Thus, for these exceptions, the caries experience for the two-year interval only is known. A number of individuals who started the experiment were dropped before the end of the first year. This was particularly true in the liberal arts schools where the students discontinued their

Table 1.—Comparison of test and control groups

	Control group		Test group		% Decrease test vs. controls
	Number of cases	Average number of new carious surfaces	Number of cases	Average number of new carious surfaces	
1st yr. clinical	306	2.21	526	0.82	63
1st yr. x-ray	308	0.87	528	0.32	63
2nd yr. clinical	146	1.11	422	0.82	26
2nd yr. x-ray	150	0.53	424	0.25	53
2 yrs. clinical	273	2.53	429	1.49	41
2 yrs. x-ray	271	1.34	429	0.53	60

education, but a few left the experiment because of a dislike of the procedure or because of noncooperation. The results were assembled in a central location and distributed to the various investigators before final statistics were compiled.

At the beginning of the experiment, and at six-month intervals, lactobacillus acidophilus counts were made according to the technic of Hadley.[22] This procedure was performed either at the institution concerned or, in the case of two groups, in the Iowa State Public Health Department. In one institution the acidophilus counts were discontinued after one year.

22. Hadley, Faith P., and Bunting, R. W., Further Studies on the Recognition of B. Acidophilus. *J.A.D.A.* 19:28 (Jan.) 1932.

Table 2.—Calculations for statistical tests of significance of differences between test and control groups

		Variance	Degrees of freedom	F	Probability of occurrence by chance alone
1st year clinical:	within groups	2.5797	830	144.95	less than .001
	among groups	373.9353	1		
1st year x-ray:	within groups	0.7757	834	76.77	less than .001
	among groups	59.5526	1		
2nd year clinical:	within groups	1.6441	566	5.537	between .01 and .05
	among groups	9.1026	1		
2nd year x-ray:	within groups	0.4710	572	17.70	less than .001
	among groups	8.3373	1		
2 years clinical:	within groups	3.7702	700	47.92	less than .001
	among groups	180.6643	1		
2 years x-ray:	within groups	1.3180	698	83.50	less than .001
	among groups	110.0564	1		

Table 3.—Calculations for statistical tests of significance of differences between test group and results of other studies

	Our test group			Other study	Average	t	Probability of occurrence by chance alone
	Number of cases	Average number of new carious surfaces	Estimated standard error of average				
1st year clinical..	526	0.82	.05264	U.S.M.A.	2.2	−26.30	less than .001
				U.S.P.H.S.	1.5	−13.00	less than .001
				D & H	1.75	−17.75	less than .001
2nd year clinical..	422	0.82	.12526	U.S.M.A.	2.2	−11.02	less than .001
				U.S.P.H.S.	1.5	− 5.43	less than .001
				D & H	1.75	− 7.43	less than .001
2 years clinical..	429	1.49	.08235	U.S.M.A.	4.4	−35.29	less than .001
				U.S.P.H.S.	3.0	−18.29	less than .001
				D & H	3.5	−24.36	less than .001
1st year x-ray....	528	0.32	.2830	Previous N.W.	1.2	−31.09	less than .001
2nd year x-ray...	424	0.25	.02794	Previous N.W.	1.2	−33.92	less than .001
2 years x-ray.....	429	0.53	.04321	Previous N.W.	2.4	−43.29	less than .001

Results

The results were compiled on the basis of new carious surfaces that developed the first year, the second year and the sum of the two years. In all cases the results were compiled on the basis of (1) clinical examinations with the use of roentgenograms, and (2) roentgenographic evidence only. The latter is probably the only objective type of examination possible in this type of experiment. Although the DMF surfaces involved were recorded for the purpose of determining the similarity of the groups, they are not herein reported as this experiment is primarily concerned with the present caries activity rather than the total lesions present. The distribution of individuals according to the number of new carious surfaces in each experimental period was also recorded in the results. The results of the test group were then compared with those of the control group and with those of other similar groups studied previously. These results were then subjected to a statistical analysis.

At the end of the experiment, it was found that the individuals in the test group had a statistically significant lower incidence of dental caries than those in the control group. This was true whether the comparison was made on the basis of clinical or of roentgenographic evidence (Tables 1 and 2). When the results were compared with those of other investigators (Table 3, and Figs. 1 and 2) similar results were obtained, although in some cases a greater difference was observed. A further analysis concerning the distribution of the cavities (Table 4, Figs. 3, 4, 5, 6) indicates a general trend. Subjects with slight caries activity developed no cavities while the more caries active became less active.

The first year controls yielded results

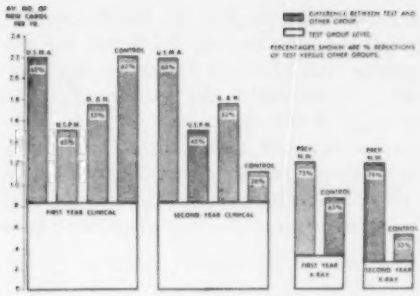

Fig. 1.—Comparison of average number of new carious surfaces developed per year, for test and control groups and other studies. First and second year results

identical with those found in students in the U. S. Coast Guard Academy[23] (2.2 new carious surfaces per year). This is slightly higher than the results of Hollander and Dunning, compiled from a study of 12,000 individuals in the Metropolitan New York area, wherein there was found an increment of 1.75 new carious surfaces per person in the similar age group. This was also higher than the U. S. Public Health Service statistics on similar age groups wherein there was found an increment of 1.5 cavities per year. The clinical results of the first-year group indicated an increase in carious surfaces of 0.8 cavities per person. This is a reduction of caries activity of 63 per cent when compared with the control group included in this experiment. The results are identical when compared with the individuals of the U. S. Military Academy. When the results are compared with the U. S. Public Health Service statistics[24] and those of individuals in the vicinity of New York City,[25] there is a reduction of 45 per cent and 53 per cent respectively.

Objective roentgenographic evidence on the first year study shows a 63 per cent reduction in caries activity compared with the controls. Unfortunately, there are few similar experiments recorded in the literature. The only other group with which to compare the roentgenographic evidence is that of previous students at Northwestern University.[18] Compared with this data, there is a reduction in caries activity of 73 per cent.

The results of the second year of the experiment show less reduction in caries activity than those of the first year. The average results of the test subjects are approximately the same in the first and second year of the experiment clinically and roentgenographically. The control subjects, however, showed less caries activity than they did the first year. Since

23. Arnold, F. A. Jr., Dean, H. T., and Singleton, D. E. Jr., Effect on Caries Incidence of a Single Topical Application of a Fluoride Solution to the Teeth of Young Adult Males of a Military Population. *J. D. Res.* 23:155 (June) 1944.

24. Private Communication.

25. Hollander, F., and Dunning, J. M., A Study by Age and Sex of the Incidence of Dental Caries in Over 12,000 Persons. *J. D. Res.* 18:43 (Feb.) 1939.

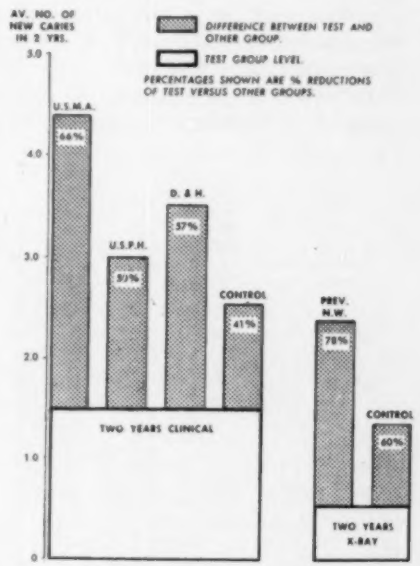

Fig. 2.—Comparison of average number of new carious surfaces in two years, for test and control groups and other studies

the control groups used no prophylactic measures, it is to be expected that the first and second years of the experiment should be fairly similar. The reason for this discrepancy is not clear, but two logical explanations could be offered. The error involved in the clinical examination may explain part of the differences. A breakdown of the data from the various schools indicates that the results may be partially explained on this basis, for the groups that changed examiners after the first examination are weighted quite heavily in this direction.

Another and more logical explanation is that news of the experiment was available to all who participated in it in four institutions, so that there may have been

Table 4.—Distribution of individuals according to number of new carious surfaces developed

Number of caries	Test group					
	1st year		2nd year		2 years	
	Clinical	X-ray	Clinical	X-ray	Clinical	X-ray
	(526 cases)	(528 cases)	(422 cases)	(424 cases)	(429 cases)	(429 cases)
0	55.70%	75.95%	57.58%	79.95%	35.20%	65.50%
1	21.86	17.99	19.43	16.04	25.64	22.61
2	13.50	4.54	12.09	3.30	17.72	7.46
3	5.90	1.14	7.11	.47	10.02	2.80
4	2.28	.38	2.84	—	6.29	1.16
5	—	—	.47	.24	2.10	.47
6	.19	—	.24	—	.93	—
7	—	—	—	—	.70	—
8	.38	—	.24	—	.70	—
9	.19	—	—	—	.47	—
10	—	—	—	—	.23	—
Total	100.00	100.00	100.00	100.00	100.00	100.00
	Control group					
	(306 cases)	(308 cases)	(146 cases)	(150 cases)	(273 cases)	(271 cases)
0	23.53%	53.25%	45.89%	68.67%	18.68%	38.74%
1	20.26	21.43	26.03	17.33	20.51	22.88
2	21.90	14.61	13.70	8.67	19.05	19.19
3	11.44	7.79	8.22	3.33	15.02	8.49
4	10.78	2.27	2.05	2.00	9.52	7.38
5	4.57	—	1.37	—	5.86	1.84
6	1.96	.33	2.05	—	3.30	1.48
7	2.61	.32	—	—	4.76	—
8	1.96	—	.69	—	2.56	—
9	.33	—	—	—	—	—
10	.33	—	—	—	—	—
11	—	—	—	—	.37	—
12	—	—	—	—	—	—
13	.33	—	—	—	.37	—
Total	100.00	100.00	100.00	100.00	100.00	100.00

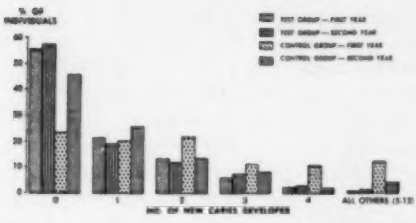

Fig. 3.—Clinical examinations for first and second years. Distribution of individuals according to number of new carious surfaces developed

a tendency for better hygiene practices in these control groups. In fact, in one institution a large percentage of the controls had to be dropped because they had changed their habits and were brushing their teeth immediately after the ingestion of sweets. Furthermore, during the time the experiment was under way, much publicity and interest on the part of the dental profession, as a result of the health education activities of the Council on Dental Health, encouraged people in general to use oral hygiene procedures immediately after eating. If this was the case, the reduction should be reflected in the roentgenographic study. The roentgenographic study does indicate a reduction in caries in the second year of examination. In any event, when the results of the test subjects are compared on a clinical basis with our own control groups and with the other available groups, it is found that there was a reduction in caries activity of 26 per cent. When compared with the statistics from the U. S. Military Academy, there is a 63 per cent reduction and when compared with the U. S. Public Health Service study and the one on individuals in the New York area, there are a 45 per cent and 53 per cent reduction respectively. The roentgenographic evidence indicates a reduction of 53 per cent when compared to our own controls and a reduction of 65 per cent when compared with the previous students of Northwestern University.

Unfortunately, since there has been no similar two years' study on the incidence of dental caries, it is impossible to compare the data of the two years' study with other groups without projecting the data of the previous one-year studies to two years. According to the data obtained by Hollander and Dunning on 12,000 individuals in the vicinity of New York City, the annual increase in carious surfaces does not change appreciably between the ages of 17 and 34. These investigators found that the annual increment of new carious surfaces was 1.75. If this data is correct, then the subjects from the U. S. Military Academy would develop 4.4 cavities, and those studied by the U. S. Public Health Service 3.0 cavities, in the two-year period, whereas those in the vicinity of New York City would develop 3.5 new carious surfaces in two years. On this basis, a comparison with the two years' study would indicate a reduction of 63 per cent, 45 and 53 per cent for the U. S. Military Academy, the U. S. Public Health Service, and the New York group statistics respectively. On the basis of the above work, it is plain that the reduction in carious

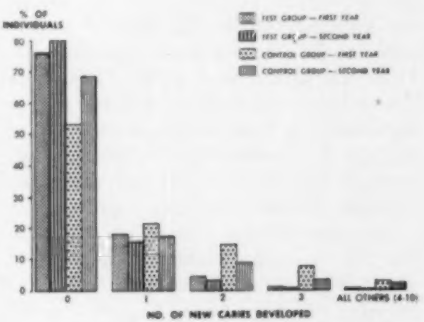

Fig. 4.—Roentgenographic examination for first and second years. Distribution of individuals according to number of new carious surfaces

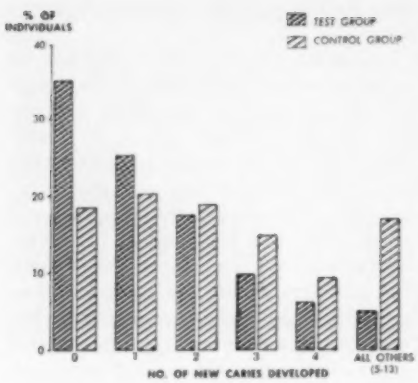

Fig. 5.—Clinical examination for total two years. Distribution of individuals according to the number of new carious surfaces developed

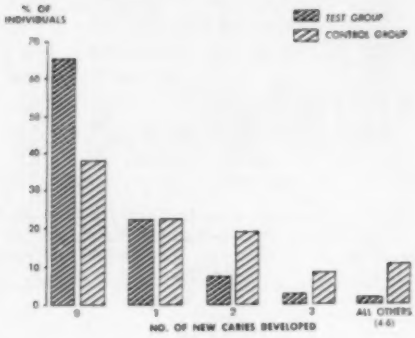

Fig. 6.—Roentgenographic examinations for total two years. Distribution of individuals according to numbers of new carious surfaces

activity by purely oral hygiene procedures is real and that the actual reduction is probably in the neighborhood of between 50 and 60 per cent.

Discussion

In any experiment of this type there are many factors that may alter results. Every effort was made to minimize these factors and at completion the data was subjected to rigorous statistical analysis. The evidence indicates that the values are significant with the possible exception of the second year clinical data. Here the probability of the differences due to chance is between one and five in one hundred, whereas in all other comparison the probability of chance occurrence is less than one in one thousand. Analysis reveals that the controls in the second year clinical study show a low incidence of caries rather than the test group showing a high incidence. A large number of individuals in these control groups were in schools where there were also individuals in a test group, and a number were dental students. Although it is definitely known that these control individuals did not use the after-meals brushing technics, it is felt by the primary investigators observing them that, during the second year, they unconsciously used better hygiene technics and rinsed the mouth after eating. When the results of the test groups are compared with the data from other sources, the degree of caries reduction remains high and is statistically significant.

One striking result of the brushing technic is the large numbers of individuals that developed only a few cavities during the one and two-year periods. Thus it seems that brushing the teeth immediately after eating will materially reduce the numbers of cavities, not in just the least susceptible, but also in those cases where a multitude of cavities would otherwise develop. Those individuals who are only mildly caries-active develop no caries and the very active ones develop only a few lesions.

It should be recorded that in general all of the individuals in both the test and control groups had soft drinks and candy readily available during the day with the exception of one control group. This factor was reflected in the variations from

group to group. The control in the school where candy and soft drinks were not available had a caries increment far below the averages reported previously in similar work. In those institutions where a water fountain was close to the soft drink and candy dispenser, less carious surfaces were found in both control and test groups than in groups where the water was absent.

The above experiment indicates that the prevention of dental caries may be much simpler than has been generally thought. It is obvious that the toothbrush or the abrasive cannot physically reach the inner portions of the proximal areas. Hence it is to be expected that the forcible dilution of the material in these areas might account for the results. There is considerable evidence to substantiate this possibility.

In view of the favorable results reported above with the unmedicated dicalcium phosphate dentifrice, it is possible that the type of dentifrice and the type of abrasive are not important. However a positive statement to this effect must await the data on the other two groups; namely, the one in which soap and calcium carbonate was used, and the one in which detergent, dicalcium phosphate antiseptic was used.

Summary

A clinical test on the efficacy of brushing the teeth immediately after the ingestion of foods with a dicalcium phosphate detergent dentifrice, indicates that dental caries can be materially reduced by this method. The results indicate that by means of simple oral hygiene procedures dental caries activity can be reduced. The results are in accord with the generally accepted theory of the carious process and materially strengthen this theory.—*311 East Chicago Avenue.*

▲

Triple the Ante.—J. O. Mercer, chairman of Council, British Medical Association in New Zealand, recently told the Canadian Medical Association that with only 1,800 doctors under the government health insurance plan, the annual cost of drugs alone has risen from £500,000 ($2,000,000) to £1,500,000 ($6,000,000). The government will not release any figures on the cost of the system but it is known that it has far exceeded the original estimate, and is increasing yearly. The fee-for-service plan is used and about 5 per cent of the doctors are profiteering on it. One doctor took £50,000 ($200,000) out of the fund in one year.—*From an editorial in Vol. 10, No. 7, July 1949, North Carolina Medical Journal, p. 381.*

MECHANICAL AIDS FOR OBTAINING ACCURACY IN DENTAL ROENTGENOLOGY

Donald W. McCormack, B.S., D.D.S., Richmond, Va.

ANATOMICAL accuracy in dental roentgenology requires reproduction of the true size and relationship of the dental structures. The basic principles for a "right-angle" procedure to fulfil the above requirements were first advocated and used routinely by Franklin W. McCormack[1] in 1913. Even now this procedure requires that the films be cut and wrapped by hand from large sheet film in order to obtain the proper sizes and to incorporate a stiff metal with the film to prevent it from bending. The target distance used is 36 inches, so it has been necessary to have the patient lie on a table instead of sit in a chair. It can readily be seen why only a limited number of men have followed the technic.

F. LeRoy Satterlee,[2] in 1913, advocated a technic based on a principle called "bisecting the angle." As this procedure could be performed more readily, it was accepted by dentistry and has been taught in dental colleges since that time. This principle seldom produces anatomically accurate results, though many variations have been tried and advanced. Most writers have assumed that the bisection of the angle principle was correct but because of the inability of the operator, it was not performed correctly. Other operators said that it was too impractical and substituted predetermined angles of projection. The images produced by these technics still show the same inaccuracies and discrepancies of years ago, even though there has been considerable improvement in equipment and films. During the last few years, however, both the dental equipment manufacturers and dentists have begun to realize that increased accuracy can only result by changing basic principles, casting aside the disproved principle of bisecting the angle and accepting the right-angle principle.

During the last 20 years, efforts have been made to standardize and improve the right-angle technic so that it can be described and taught. The basic fundamentals were again published in 1937,[3] and have since been modified so as to be used with dental x-ray equipment and the dental chair, using target distances of 14 inches or greater.

A 20-inch target distance is about the maximum that can be used in the average dental office with the patient sitting in a dental chair. Target distances greater than 20 inches are still more accurate, but the patient should lie on a table. In this manner, target distances up to 36 inches can be used, resulting in the highest degree of anatomical accuracy.

Fitzgerald[4] and Waggener[5] teach the

Associate Professor of Oral Surgery and Oral Roentgenology, Medical College of Virginia.

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2. Satterlee, F. Le Roy: *Dental Radiography*, New York, Swentarton Stationery Co., New York, 1913.

3. McCormack, Donald W.: Dental Roentgenology: A Technical Procedure for Furthering the Advancement Toward Anatomical Accuracy, *J. California D. A.* 13:89 (May-June) 1937.

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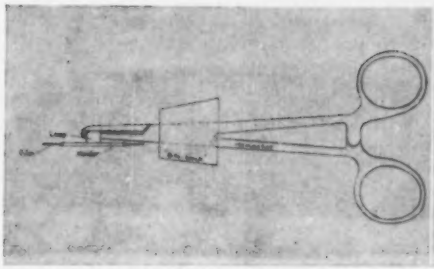

Fig. 1.—Assembly of film, film holder, rubber bite-block and hemostat.

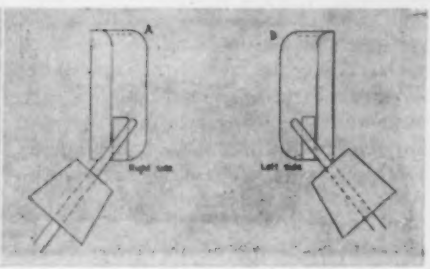

Fig. 2.—Upper anterior regions. Hemostat clamped through holder and film folded back

20-inch target distance to their students and the technic has been taught to many other dentists and their assistants who are finding it practical. Before adopting the technic, however, it must first be accepted that the procedure will require an increase in both operating time and the number of films used for each patient. Instead of roentgenograms being an undependable adjunct to clinical diagnosis, the anatomically accurate images obtained with the 20-inch procedure become one of the most valuable diagnostic aids. They are used in the search for physiologic and pathologic changes instead of just to verify other clinical findings.

The two mechanical aids to be described, a film holder and a target distance localizer, are both necessary devices for performing the right-angle technic successfully in the shortest possible operating time and with the least discomfort to the patient.

Film Holder

To perform the "right-angle technic, a film holder is required that will keep the film flat, prevent bending, and hold it in proper position in the mouth. Bending of the film is the greatest distortion factor; it produces an image comparable to the distortion given your reflected image by a warped or curved mirror. The film holder to be described (Fig. 1) consists of the following: (1) two metal plates (the holders), one for holding the film in a horizontal position and one for holding the film in a vertical position; (2) a rubber bite-block that slips over the jaws of a hemostat; and (3) the hemostat. The film is placed in the slots provided on the backs of the plates. The patient holds the handle of the hemostat which clamps on the metal loop of the holder, to steady it in all regions of the mouth.

For the upper anterior region, the vertical holder is used and the hemostat is clamped diagonally through the loop. The bite-block is turned so that the thin side is toward the lower incisors, or it can be removed. The teeth do not close on the bite-block in this instance, as the mouth is kept open (Figs. 2 and 3). In this region, the vertical holder can be held in position with the thumb, while cotton rolls hold the end of the film away from the incisal edges of the teeth (Fig. 4). The latter plan is most satisfactory where the full width of the film is used.

Figure 2 also shows the film being folded along one edge around the back of the holder, and this folded edge is held in position with the hemostat while clamping the metal loop. This is necessary in mouths with narrow vaults.

For the lower anterior regions, the vertical holder is used and the bite-block is placed over the jaws of the hemostat as shown in Figure 5. For mouths of various depths, the hemostat can be clamped anywhere along the loop, and the bite-block can be turned so that the thin side is toward the lower incisal edges. The film can be folded back as shown, or left full-size if the width of the mouth permits. The teeth, in approximately the area of the cuspid and first bicuspid, close on the bite-block, and the patient holds the handle of the hemostat (Fig. 6).

For the upper bicuspid region (Fig. 7) the vertical holder is preferred as it allows the film to extend higher into the vault. The choice of holder will probably depend upon the type of mounting selected (described later) and upon the height of the vault. The position of the hand holding the hemostat in this and other upper regions, is shown in Figure 8.

A downward pressure with the fingers on the handle of the hemostat is usually sufficient. However, if the anterior teeth do not close uniformly on the bite-block, the thumb may also engage the handle.

For the lower bicuspid region, the verticle holder is used, as it is easier to get the film deep in the mouth. Most mounts accommodate the vertical lower bicuspid film (Fig. 9). The thumb and fingers both hold the handle of the hemostat, and an upward pressure with the thumb will keep the film down in position (Fig. 10). This applies to lower molar regions also.

For the upper (Fig. 11) and lower (Fig. 12) molar regions, the horizontal holder is used. Figures 11 and 12 also show the position in which the hemostat should be clamped in the average mouth, in mouths that are deep, have long roots or high vaults, and in shallow mouths, edentulous mouths or children. Note that in Figures 8 and 10, the handle of the hemostat is seen parallel to the wire of the localizer. Figures 13 and 14 show the procedures for upper and lower posterior regions, with the patient lying on a table. The hand holding the hemostat rests on a sand bag.

The horizontal and vertical holders can be used in all areas of the mouth without the hemostat; the holder is supported with cotton rolls and held with the patient's thumb or fingers. This procedure is not as accurate, however, so it is preferable to learn to use the hemostat. When using the hemostat it is necessary to exercise special precaution to prevent movement by placing the patient's hand in proper position. The hand holding the

Fig. 3.—Upper left incisor region. Left hand is supporting right hand which holds handle of hemostat

Fig. 4.—Upper left incisor region. Thumb supports film holder and cotton rolls keep film away from crowns of upper incisors

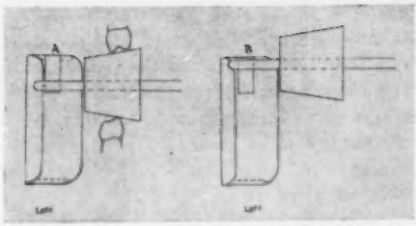

Fig. 5.—Lower anterior regions. Hemostat clamped at right angles to loop of holder: A, position for incisors; B, for cuspids. Film folded back around holder to form narrow film

hemostat should rest firmly against the face, the other hand can be used as additional support, and the teeth should close tightly on the bite-block.

There is also a narrow Eastman film on the market that can be used for the upper and lower anterior regions. It is slightly shorter than the other films and would necessitate a third holder. However, it can be used satisfactorily without a holder as its metal backing is quite stiff and it can be held with the finger or thumb; or the hemostat can be clamped on the edge of the film itself. The Rinn mount (EZ-24) accommodates the narrow anterior films, though they must be trimmed slightly to fit.

Target Distance Localizers

When operating at target distances greater than the rim of the short cone, or tip of the short pointer, it is well to use some device for obtaining correct distance and angulation.

A metal cylinder (long cone) extending from the apparatus to the face is one way of fulfilling this requirement, but it has two disadvantages. First, it establishes a definite target distance that cannot be decreased without removing the cylinder. Second, the film usually must be placed in the mouth before positioning the cone. The latter is undesirable, mainly because it means that the film is in the mouth two to five times as long as it should be; the cone must be positioned more quickly so there is less chance of obtaining the correct angulation; and there is more chance of movement of both patient and apparatus. Only an experienced operator can perform this feat successfully.

The reverse procedure is more desirable; that is, to position the apparatus first and then place the film in the mouth. It allows time to determine the angulation and position the apparatus; allows the apparatus to cease any movement while the film is being placed; the exposure can then quickly be made and the film removed. To facilitate this routine a thin localizing rod of metal or plastic, attached at one end to the apparatus, and with a ring (3 to 4 inches in diameter) attached to the other end, is used in place of the cylinder or long cone.

If the ring were made of plastic instead of metal, it would scarcely show if it were superimposed over the film. However, with careful positioning, superimposition of the ring over the film should not occur.

Fig. 6.—Lower left incisor region. Hand placed against face for stability, fingers holding handle of hemostat, and teeth biting on rubber bite-block

The rod and ring are slightly flexible and can press against the patient's face, to help steady the patient and the apparatus, without discomfort. More important, however, is the fact that when the ring is against the face over the region of the film, it not only localizes the central rays, but the face can be seen and the fingers of the operator can extend through the ring and pull back the lips

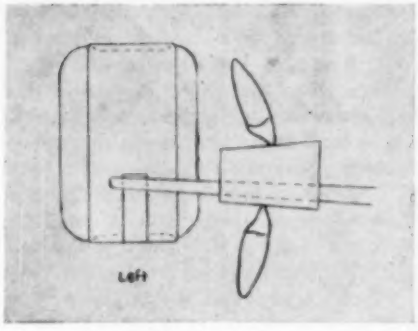

Fig. 7.—Upper bicuspid region. Use of vertical holder (preferred) and clamping of hemostat on loop

to see the crowns of the teeth or the angle of inclination of the interproximal spaces. When proper angulation is obtained, the film is placed in position, the operator watching it through the ring, and the exposure is made. An important factor in making accurate, sharp images is promptness in making the exposure after positioning the film. This is especially true in the posterior regions when a patient is apt to gag, or when the film causes pressure and pain.

The long cone, or cylinder, that has a pointed plastic cap at the far end is more efficient than the cylinder alone but not as efficient as the rod and ring.

An extension, localizing rod, made of metal tubing approximately ⅛ inch square, and a square rod to fit inside the tubing, is a more efficient arrangement than the single rod. The square tubing is fastened to the apparatus and the ring is fastened to the end of the square rod. The main advantage of this arrangement is that by making marks on the rod, definite variations in target distances are obtained; the ring end can be readily removed (Fig. 10).

A fixed target distance (e.g., 20 inches) for all patients necessitates considerable variation in exposure factors for men, women, children, edentulous mouths, and so forth. As the dental x-ray apparatus, at that distance, is being used at about its maximum capacity, there may not be sufficient penetration for a patient with thick overlying soft tissue and dense bone

Fig. 8.—Upper posterior regions. Fingers pressing down on handle of hemostat which keeps film pressed up against vault. Note handle of hemostat parallel to localizing wire

structure without considerable increase in exposure time. Also, for a small person, or for an edentulous mouth, the exposure time must be decreased. Too long an exposure time is detrimental to the x-ray tube, uncomfortable for the patient, and apt to result in movement. Too short an exposure time does not allow for enough latitude in image densities.

By means of the extension localizer, a routine series of standard exposure times for all types of mouth can be evolved so that the target distance can be varied

from patient to patient instead of the exposure time, kilovoltage or milliamperage. Decision of the target distance to use for any one patient is a matter of judgment gained by experience, and is the same problem as judging the exposure time for each patient. The former requires only one change before starting on the patient, whereas the latter requires a change in exposure time for each area of

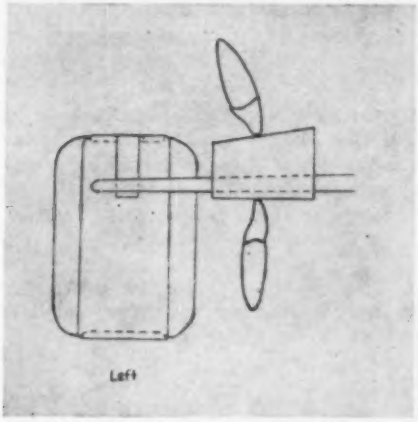

Fig. 9.—Lower bicuspid region. Use of vertical holder (preferred) and clamping of hemostat on loop

the mouth. The average target distance and series of exposure times that can be used by any operator depend on the capacity of his equipment. In Table 1 appear average figures which can be used in establishing a technical routine. This table has been developed for use with the chair or table technic although it is difficult to perform the procedure in the chair at target distances greater than 20 inches.

With the patient lying on a table, even greater anatomical accuracy may be obtained, as a target distance of 36 inches becomes quite practical. In this manner, the x-ray tube can be directed downward toward the patient for all exposures. Instead of moving the apparatus around the patient, as must be done when he is in a chair, the patient's head is rotated from side to side on a pillow and the apparatus moves very little. The hand that holds the film holder rests on a sandbag for stability. This procedure represents the ideal in technic. The patient is more relaxed when resting comfortably on a soft mattress; fewer retakes are necessary as each film can be placed in position more accurately and held more steadily; and images can be obtained of regions that would be almost impossible in a sitting position.

The last point to be considered in re-

Fig. 10.—Hand against face, thumb pressing upward on handle of hemostat, and incisors biting on bite-block. Note also use of extension localizer with which length can be varied. Square rod slides in square tube

gard to increased target distance technics, using increased milliamperage, is that of controlling excessive primary and secondary radiation. In order to use increased target distance, it is necessary to use faster films. Eastman Ultra-Speed and Rinn Extra-Fast films allow even shorter exposure times at increased distances than the exposure times necessary with Eastman Regular film at short target distances. Hence, it is not necessary to increase the amount of primary radiation reaching the patient for increased

target distance, but it is necessary to confine the area of primary radiation so that these rays are stopped as much as possible by the patient's head. The cylinder, or long cone, satisfactorily confines the primary rays, if it is lead-lined, to an area the size of the opening. With the patient's head close to the opening, there is little secondary radiation.

To make the extension localizer safe, a lead disk, $\frac{1}{16}$ inch thick, with a small hole in the center, should replace the lead disk already in the base of the cone. The size of the hole should be such that it confines the area of radiation inside the circumference of the ring (approximately 3 to 4 inches in diameter) at the average target distance to be used. The size of the hole can be tested by placing a film half in and half out of the ring and exposing it to the rays. The outer half should not be activated by the radiation.

When the target distance is decreased (ring moved closer to the apparatus), the area of radiation becomes smaller, so a little more care must be exercised in centering the film. For example: If the diameter of the area of radiation is 4 inches at a 20-inch target distance, it is 3.2 inches at a 16-inch target distance and 4.8 inches at a 24-inch target distance. This can be worked out geometrically for any distance. As long as the area of radiation is confined to the smallest working limits, the secondary radiation will be cut to a minimum as most of the primary radiation will be absorbed by the patient's head. The operator, in any case, should stand behind the apparatus, never in a direct line with the primary radiation. It is preferable for the operator to stand behind a lead screen,

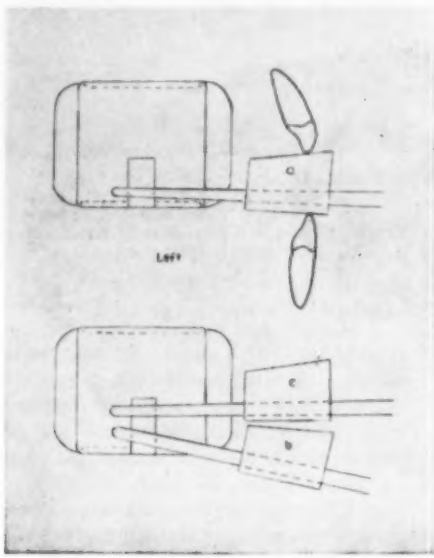

Fig. 11.—Upper molar regions

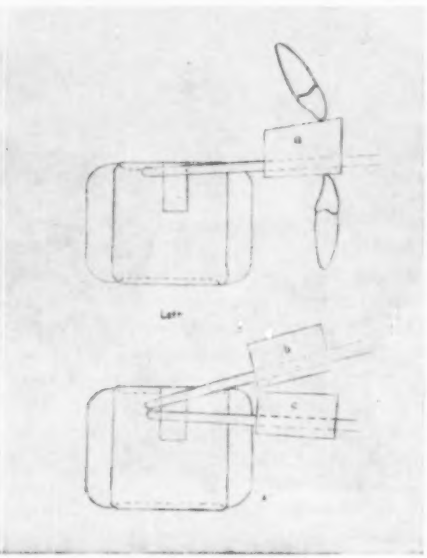

Fig. 12.—Lower molar regions

Use of horizontal holder and clamping of hemostat in position: a, for average mouth; b, for mouths that are deep, have long roots or high vaults; and c, for shallow mouths, edentulous mouths or children

Fig. 13.—Upper posterior regions, table technic

Fig. 14.—Lower posterior regions, table technic

Hand, holding handle of hemostat, rests on sandbag for increased stability. Patient more relaxed and comfortable. Target distances up to 36 inches can be used with ease

especially when using the table technic.

Theoretically, if the ultra-speed or extra-fast films are six times as fast as the regular films, the patient could withstand six times as many exposures (only one sixth the exposure time being necessary) without having excessive radiation. The longer target distance offsets the increase in milliamperage and, with the increased speed of the film and slightly shorter exposure times, the patient can still tolerate six times as many exposures. The air also absorbs some of the longer, more harmful rays and increases the safety factor.

If, occasionally, the operator desires to expose larger areas, as a hand, jaw or head, the extension rod and ring can be removed so as not to show in the image, and the lead disk with the small hole can be removed to increase the area of radiation. In carrying out experiments to determine the average target distance to be used, a piece of string can be fastened to the apparatus with knots tied in it at two-inch intervals. When the proper target distance is determined, the wire localizer can be made.

All of the above variations in increased target distance technics, using both the

Table 1.—Average target distances and exposure times

Output of apparatus (milliamperes)	Average target distance (inches)			Average exposure times for all patients at all distances (seconds)		
	Men	Women	Children		Lower	Upper
10	14	16	18	Centrals	2¼	2½
15	18	20	22	Cuspids	2½	3
20	22	24	26	Bicuspids	3	3½
30	26	28	30	Molars	4	4½

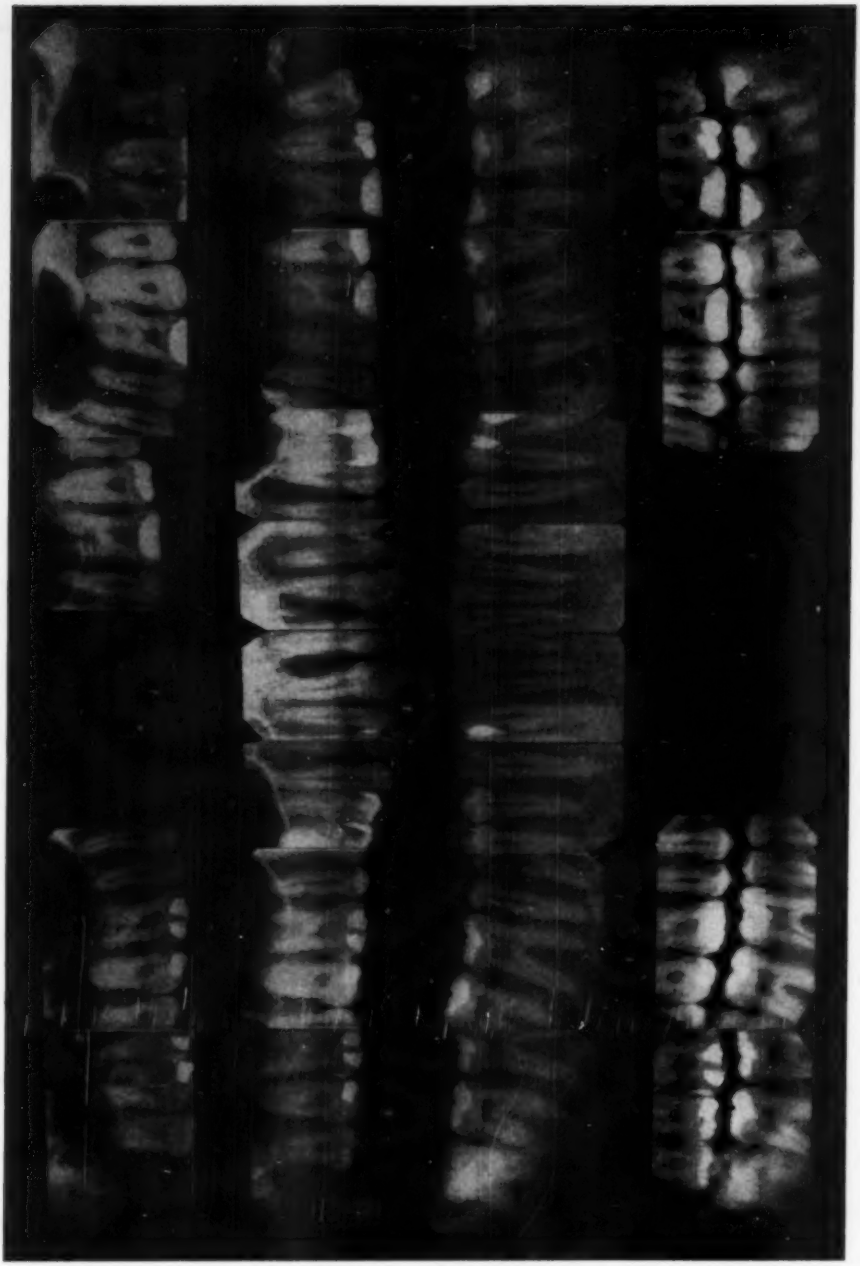

Fig. 15.—Roentgenograms of complete mouth. Note that those in the two center rows, upper and lower, were made by right-angle technic and the crowns of the teeth appear about the same as those in the bitewings in the lower row. Apical roentgenograms in center row have not been chemically reduced

chair and the table, are being performed at the dental college.

Mounting Films

Eighteen apical films is the minimum that should be used in following the right-angle technic. These films can be accommodated in the Rinn mount, EZ-314-42 or EZ-716-22. When using these mounts only three films are used in the upper and lower anterior regions, and used full size (not folded). If one or two bitewing films are desirable on each side of the mouth, they can be mounted separately (EZ-4H). One long narrow bitewing film on a side is not as accurate as two separate smaller films.

When it is necessary to fold the anterior films—and this procedure is always more accurate—four films should be used instead of three for the upper and lower anterior regions; the folded portion of the film should be cut off after processing and drying. Rinn mount (EZ-24) is made to accommodate these narrow anterior films, and it has additional windows for extra posterior apical films or bitewing films.

The best type of mount for cases that require from 18 to 26 films is a sheet of plastic, 8 x 10 inches in size and .015 inches thick. Any size or number of films can be matted to the plastic with black Scotch tape. This type of mounting takes more time, but it is desirable because it covers very little of the edge of the films (Figure 15).

Figure 15 illustrates a case in which 25 films were used. Careful study will bring out the fact that all roentgenograms in the two center rows (upper and lower) are made by the right-angle technic, and the crowns of the teeth appear about the same as those in the bitewings (mounted in lower row). Though the angulation of the apical roentgenograms in the center row is about the same as the bite-wings, the former have not been chemically reduced. The bitewing roentgenograms are for the purpose of finding incident caries, leaking fillings, relation of caries to the pulp, to differentiate between cement and metal restorations and so forth. Slightly overexposing and then chemically reducing the bitewing films gives them more contrast and makes them more valuable. Overexposing the apical films is not desirable because excessive contrast can make the bone structure appear more osteoporotic or some of the crest of the alveolar process can be lost.

When the roentgenograms in the center row do not extend to or beyond the apexes of the teeth, as noted in some of the upper films, additional ones are taken from an increased angle of projection. These are mounted in the top row (upper films) or in the bottom row (lower films) along with the bitewings. The top row of roentgenograms, somewhat distorted due to increased angulation, should not be used to interpret conditions shown accurately in the center row, but used only for apical conditions. Comparison of the roentgenograms in these two rows will show a difference in the relationship between caries and the pulp, crest of the alveolar process and the neck of the tooth, roots of the teeth to the floor of the antrum and malar shadow, and in the density of the alveolar bone.

▲

Egotist.—Next to the pleasure of writing lovingly about ourselves—but not comparable to it—is the pleasure of writing unlovingly about our fellows. Next to the joy of the egotist is the joy of the detractor.—*Agnes Repplier, "Under Dispute."*

A CRITICAL REVIEW OF THE NEWER METHODS PROPOSED FOR THE REDUCTION OF DENTAL CARIES

Albert H. Kniesner, D.D.S., Cleveland

Ammonia nitrogen developed in human saliva by natural processes has the ability to inhibit the growth of *L. acidophilus*. Dibasic ammonium phosphate used orally in a mouth rinse and dentifrice caused a marked reduction in the oral lactobacillus counts but has not reduced the number in some subjects to a level that would indicate an arrest of dental caries. It appears from bacteriologic observations that the use of an ammonium-containing dentifrice and mouth rinse as employed by the average individual may not completely check caries activity. Other measures, particularly dietary management, may be necessary to establish at least initial control.

ENTHUSIASTIC vendors offer the public protection from the distressing thought of developing new cavities by claiming they are virtually selling preventive dentistry in a can by the ounce. They point confidently to a bibliography which lists names of prominent men in dental research, regardless of whether any clinical studies pertaining to their product are included. A glaring example of the latter practice may be found in a pamphlet circularized by the manufacturers of Amion in which the following seven references were supplied.

Grove and Grove[1] recommended the utilization of quantitative determinations of salivary ammonia content as an index of caries susceptibility, but made no claim to have prevented the occurrence of caries by the use of ammonium ions.

Hill[2] did not even mention the word "ammonium" in his paper.

Becks, Jensen and Millarr[3] presented data on the effects of restricted carbohydrate diets on *L. acidophilus* indices and caries experience. Again, no mention of ammonium.

Kesel and others[4,5,6] cautiously stated in their summary[6] that:

Amion does not happen to contain dibasic ammonium phosphate with which the reported oral lactobacillus counts were reduced.

Stephan and Miller[7] were the only authors who reported a clinical study of caries incidence, and their investigation included six subjects. Except for this latter report, none of the other six presented data regarding the effect of an ammonium-containing dentifrice on den-

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1. Grove, C. J. and Grove, C. T., Chemical Study of Human Saliva Indicating that Ammonia Is an Immunizing Factor in Dental Caries. *J.A.D.A.*, 22:247, (Feb.) 1935.

2. Hill, T. J., A Salivary Factor Which Influences the Growth of Lactobacillus Acidophilus and Is an Expression of Susceptibility or Resistance to Dental Caries. *J.A.D.A.*, 26:239 (Feb.) 1939.

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5. Kesel, R. G., O'Donnell, J. F., Kirch, E. R., and Wach, E. C., The Biological Production and Therapeutic Use of Ammonia in the Oral Cavity in Relation to Dental Caries Prevention. *J.A.D.A.*, 33:695 (June) 1946.

6. Ibid., Ammonia Production in the Oral Cavity and the Use of Ammonium Salts for the Control of Dental Caries. *Am. J. Orthodont. and Oral Surg.* 33:80 (Feb.) 1947.

7. Stephan, R. M. and Miller, B. F., Effectiveness of Urea and of Synthetic Detergents in Reducing Activity of Human Dental Caries. *Proc. Soc. Exper. Biol. & Med.*, 55:101 (Feb.) 1944.

tal caries experience with which Amion was ostensibly concerned.

These investigations were by authors of the highest caliber who are respected as men of stature in the field of dental research, but reference to their publications for the purpose of corroborating the claim made in this pamphlet that "Amion, a product of Roerig research, is specifically designed to aid in the prevention and arrest of dental caries," is misleading.

Ammoniated Dentifrices

What studies have nurtured the belief that salivary ammonia may be a factor influencing the carious process?

Sixty years ago, Miller[8] observed that mixtures of saliva and egg white produced an alkaline reaction which could be transformed to an acid reaction by the addition of sugar to the original mixture. Grove and Grove[9] found higher ammonia levels in the salivas of caries-resistant persons than in those with active caries. They did not recommend that ammonia be introduced artificially in the oral cavity for the prevention of caries.

White and Bunting[10] repeated the work of Grove and Grove and could find no correlation between the ammonia content of saliva and caries activity. Nor could Youngburg[11] demonstrate that caries activity was related to the salivary ammonia content.

Grove and Grove[9] promised to report on the possibility that ammonia in sufficient quantity in the saliva may be inhibitory to the growth of *L. acidophilus*, and in 1942[12] stated that when 0.2 ml. of a 0.006 per cent ammonium solution was added to Snyder's media which contained whole saliva as the inoculum, acid production, as evidenced by color change, was prevented in all 25 specimens tested, which they interpreted as meaning the lactobacilli of the saliva were inhibited.

Stephan[13] invited the attention of readers of *Science* to his findings which served as the initial impetus for the study of synthetic urea and its effect on dental caries when introduced artificially in the mouth. To quote in part:

> Previously, the saliva has been thought to neutralize the acid "plaques" on tooth surfaces by virtue of the buffers it contains when secreted from the salivary glands. Now, however, it has been discovered that in addition to the secreted buffers, the urea in saliva is converted to ammonium carbonate, locally on the tooth surface by the action of certain urease-containing bacteria (such as *Staphylococcus albus* and *aureus*) which grow on the tooth surface in the bacterial "plaque." This ammonium carbonate neutralizes some of the acids which might otherwise produce caries activity. The urease is present in the bacteria as an endoenzyme and is not dissolved in the saliva.

By attaching a pointed antimony electrode to a direct reading pH meter, the ability of a 10 per cent glucose rinse to lower the pH of plaques and cavities of upper anterior teeth was demonstrated.[14] Different pH curves were shown to exist for caries-resistant and caries-susceptible individuals.[15] Stephan based his interpretation of the "decalifying level" on the reports of previous investigations.[16, 17, 18] He states that:[19]

8. Miller, W. D., *The Micro-organisms of the Human Mouth*, Philadelphia, 1890, the S. S. White Dental Mfg. Co., p. 205.

9. Grove, C. J. and Grove, C. T., The Biochemical Aspect of Dental Caries. *D. Cos.*, 76:1029, (Oct.) 1934.

10. White, J. and Bunting, R. W., An Investigation into the Possible Relationship of Ammonia in the Saliva to Dental Caries. *J.A.D.A.* 22:468 (March) 1935.

11. Youngburg, G. E., Salivary Ammonia and Its Relation to Dental Caries. *J. D. Res.*, 15:247 (Sept.) 1936.

12. Grove, C. T. and Grove, C. J., Action of Ammonia on Lactobacillus and Salivary Mucin. *J.A.D.A.* 29:1215 (July) 1942.

13. Stephan, R. M., Two Factors of Possible Importance in Relation to the Etiology and Treatment of Dental Caries and Other Dental Diseases. *Science*, 92:578, 1940.

14. Ibid., Changes in Hydrogen-ion Concentration on Tooth Surfaces and in Carious Lesions. *J.A.D.A.* 27:718 (May) 1940.

15. Ibid., Intra-oral Hydrogen-ion Concentrations Associated with Dental Caries Activity. *J. D. Res.* 23:257 (Aug.) 1944.

16. Holt, L. E., La Mer, V. K., and Chown, H. B., Studies in Calcification I. *J. Biol. Chem.* 64:509, (July) 1925.

17. Enright, J. J., Friesell, H. E., and Trescher, M. O., Studies of the Cause and Nature of Dental Caries. *J. D. Res.* 12:759 (Oct.) 1932.

At some pH value, between 5.0 and 5.5, there probably exists a "critical decalcifying pH level," above which the solubility product for calcium phosphate in the oral fluids would be satisfied, and decalcification of enamel should not occur.

When the pH readings are plotted against time, the rapidity with which the pH drops, as well as the duration of that drop, can be compared graphically with curves produced by test rinses. The control pH curve was standardized by rinsing the mouth with 25 cc. of a 10 per cent aqueous solution of glucose for two minutes. The pH measurements were made at a two-minute interval after the rinse and then at ten-minute intervals until the pH had risen to the initial value.

It was demonstrated by Stephan[20] that when a rinse consisting of 10 cc. of a 50 per cent aqueous solution of urea was used for four minutes, and then followed immediately by several rinses of distilled water, a prolonged rise in the pH of plaques in cavities occurred. This rise was not appreciably affected by additional rinses of 10 per cent glucose, and existed for a period up to 24 hours.

Only six patients were included in a study on the effect of urea on caries experience.[7] After these patients were observed during a control period of about 18 months, they were instructed to apply a 45 per cent solution of urea to all accessible tooth surfaces with a toothbrush for a period of four minutes, either before or immediately after breakfast and supper. The number of intact surfaces per patient at the beginning of the experimental period ranged from 26 to 107. Only 8 lesions, as compared with 152 new lesions in the control period, had developed in an average of 23 months.

Although carefully performed, this cannot be considered adequate clinical evidence, particularly in view of the small number of intact tooth surfaces which existed in these six patients at the beginning of the experimental period.

The investigations of Kesel and his associates[4,5] will now be outlined. They found that if caries-resistant saliva were permitted to stagnate in the incubator for eight days, and then passed through a Seitz filter, this filtrate would not support the growth of lactobacilli present in the saliva of a caries-active individual when glucose was added to the mixture. Bacteriological studies resulted in the isolation of *Aerobacter aerogenes* which, together with a nonidentified gram-positive chain-forming bacillus, increased the ability of *A. aerogenes* to destroy lactobacilli.

Evaporation to dryness of the filtrate medium where *A. aerogenes* had grown resulted in complete loss of inhibitory properties. They reasoned that this inhibiting substance was volatile. Analysis of the distillate showed that the amount of ammonium nitrogen was proportionate to the degree of inhibition that filtrate would produce on lactobacilli.

The basic salts of ammonia were found to inhibit lactobacillus growth. A 5 per cent dibasic ammonium phosphate toothpowder and rinse was used by 45 individuals with high lactobacillus counts. After one year, the 33 remaining patients had markedly reduced lactobacillus counts.[5] No appreciable change occurred in the lactobacillus counts of ten caries-susceptible individuals who served as controls for five months.

A modification of the dentifrice and rinse was made by adding 3 per cent urea. The original group of 33 individuals (age range 5 to 34 years, average age 18.6 years) used this preparation for another year. In 19 of the 33 individuals no new lesions developed during the two-

18. Bibby, B. G., Volker, J. F., and Van Kesteren, M., Acid Production and Tooth Decalcification by Oral Bacteria. *J. D. Res.* 21:61 (Feb.) 1942.

19. Stephan, R. M. and Miller, B. F., A Quantitative Method for Evaluating Physical and Chemical Agents Which Modify Production of Acids in Bacterial Plaques on Human Teeth. *J. D. Res.* 22:45 (Feb.) 1943. (Footnote 3.)

20. Stephan, R. M., The Effect of Urea in Counteracting the Influence of Carbohydrates on the pH of Dental Plaques. *J. D. Res.* 22:63 (Feb.) 1943.

year experimental period. The fourteen who developed caries had 20 new lesions among them. This is a remarkably low caries experience. To quote Kesel's own commentary on these figures,[21]

> I hesitate to show these results, for I realize the group is not nearly large enough to be statistically significant and not adequately controlled because these individuals had been very caries active before the brushing treatment. They had had many of the vulnerable surfaces already restored by good operative procedures; therefore they did not have as many susceptible areas when they went on this study.

A critical analysis of the data submitted by Henschel and Lieber,[22] whose research has resulted in the Amm-I-Dent formula, offers clinical proof that complete operative rehabilitation of the dentition is as efficacious as the consistent use of that product. Although this report did not specify the ingredients of the dentifrice employed except for the term "ammonium," from full-page advertisements it can be learned that it consisted of "22.5 per cent carbamide (synthetic urea) plus 5 per cent dibasic ammonium phosphate, with gentle abrasives and aromatic oils."

Four groups were reported[22] as follows. The test group, 100 consecutive cases with an average age of 37.5 years, experienced 2.39 DMF per year while using cosmetic dentifrices for 10.7 years which was referred to as the "auto-control period." While using the ammonium dentifrice for 34.3 months, the DMF average per year was 1.55. (It was not specified in this abstract whether DMF referred to teeth or surfaces.)

Fifty consecutive cases with an average age of 36.1 years served as the check control group. An average overall observation period of 12 years was arbitrarily divided into a pretest period averaging nine years, and a test period of the last three years (or that period nearest to 36 months from which examination data were recorded). The usual cosmetic dentifrices were used throughout both periods. The rate during the pretest period was 2.31 DMF per year and during the test period was 2.48 DMF per year, or an average DMF per year increase of 7.3 per cent.

Thirty consecutive cases of complete operative rehabilitation comprised a third group. This group averaged 35 years of age and, after completion of treatment, began using the ammonium dentifrice for an average of 27 months. This group's caries experience was only 1.00 DMF per year.

A fourth group consisted of 40 consecutive cases with an average of 9.8 years. These children used the ammonium dentifrice for 27 months and averaged 1.74 DMF per year.

Now to examine these data. No control group for the last mentioned 40 young children was presented. Certainly the check control group, with an average age almost four times that of the children's group, cannot be considered an adequate control. The age factor in studies of dental caries cannot be disregarded.

When the figure submitted for the "complete operative rehabilitation" group of 1.00 DMF per year is compared with the test check control group of 2.47 DMF per year, it can be calculated that this experimental group experienced a reduction of 1.48 DMF per year, or a reduction of 60.0 per cent. This figure of 60.0 per cent is almost twice that of the first mentioned test group, and by this procedure it can be deduced validly that the complete restoration of existent lesions had almost accomplished as much caries control as

21. Enslick, K. A., *Dental Caries, Mechanism and Present Control Technics*. St. Louis, The C. V. Mosby Company, 1948, p. 96.

22. Henschel, C. J. and Lieber, L. Eastern Graduate Research Group, New York, N. Y., Relative Efficacy of 27.5% Ammonium Therapy Dentifrice. *J. D. Res.* 27:714 (Dec.) 1948. Abstract.

had the action of the ammonium dentifrice itself.

The reduction attributed to the incorporation of ammonium in the dentifrice may have been exaggerated even further as evidenced by the closing sentence of this abstract: "Some proportion of the apparent caries incidence reduction may be attributed to enthusiastic oral hygiene heightened by the knowledge of the possible therapeutic benefit of the dentifrice."

Two other references,[23,24] listed in Amm-I-dent advertisements, present no original data. The promotional scheme of declaring publicly the reduced caries experience of Amm-I-dent users whose photographs appeared in *Life* magazine (April 18, 1949, pp. 4 and 5), together with a notary public's statement attesting the sworn testimony of their dentist's records, obviously deserves no comment.

Tooth Impregnation for Caries Prophylaxis

Another recent innovation regarding a proposal for the reduction of dental caries has sprung from the hypothesis that the initial carious lesion is primarily proteolytic in nature and is accomplished by an invasion of microorganisms into the lamellae of enamel. Upon this hypothesis is built the opinion that the application of drugs to the crowns of teeth can produce a mechanical obstruction of these so-called "invasion roads." Verification of this hypothesis has not yet been generally conceded. In fact, this theory has been vigorously denounced. It is not the purpose of this paper to present an exhaustive examination of this argument, but since an intelligent discussion of this new attempt to reduce caries cannot be given unless the concepts of both sides are considered, at least a documental summary of the lesser known theory of caries production appears in order.

Gottlieb[25] suggested the theory that caries of the enamel begins as a proteolysis of organic structures. Later[26] he described a yellow pigmentation which accompanied this proteolytic degeneration. Pincus[27,28] and Frisbie and others[29] shared similar views. In Gottlieb's earlier work,[25] he showed that teeth resisted caries when the outer portions of the lamellae were completely hornified.

Bibby's findings[30] showed a densely pigmented structureless mass on the changed enamel surfaces of old caries-resistant teeth, which could serve as a "passive defense" against decalcification and caries. Malleson[31] observed this increased staining characteristic of some enamel. This reported brownish pigmentation of the enamel surface may well explain the darkening of teeth with age and the relative resistance of darker teeth to caries referred to by Bodecker.[32] Mummery[33] also observed changes in the enamel.

This pigmented, amorphous, keratin-like substance described by Chase[34] in 1926, and later by von Korff,[35] Bibby[36]

23. Henschel, C. J., Caries Control by Chemical Prophylaxis. *New York, J. Den.* 16:102 (March) 1946.

24. Grossman, L. I., Practical Measures for Reducing the Incidence of Dental Decay. *New York D. J.* 13:509 (Nov.) 1947.

25. Gottlieb, B., Ätiologie und Prophylaxe der Zahnkaries; *Zeitschr. f. Stomatol.* 19:139 (Feb.) 1921.

26. Ibid., Dental Caries. *J. D. Res.* 23:141 (April) 1944.

27. Pincus, P., Caries: Attack on Enamel Protein in an Alkaline Medium. *Brit. D. J.* 63:511 (Nov.) 1937.

28. Ibid., Caries: A New Theory of the Cause. *Illinois D. J.* 9:80 (March) 1940.

29. Frisbie, H. E., Nuckolls, J., and Saunders, J. B. de C. M., Distribution of the Organic Matrix of the Enamel in the Human Tooth and Its Relation to the Histopathology of Caries. *J. Am. Col. Den.* 11:243 (Sept.) 1944.

30. Bibby, B. G. and Van Huysen, G., Changes on the Enamel Surface, A Possible Defense Against Dental Caries. *J.A.D.A.* 20:828 (May) 1933.

31. Malleson, H. C., The Histology of Enamel Caries. *Brit. D. J.* 46:907 (Aug.) 1925.

32. Bodecker, C. F., The Color of the Teeth as an Index of Their Resistance to Decay. *Internat. J. Orthodont.* 19:386 (April) 1933.

33. Mummery, J. H., Translucent Zones in Enamel. *Brit. D. J.* 47:473 (May) 1926.

34. Chase, S. W., The Origin, Structure and Duration of Nasmyth's Membrane. *Anat. Rec.* 33:357, 1926.

35. Von Korff, K., Die Zusammensetzung und Entstehung der sogenannten nasmythschen Membran und der Cuticula dentis primitiva. *Deutsche Monatschr. f. Zahnh.* 48:817, 1930.

36. Bibby, B. G., A Study of a Pigmented Dental Plaque. *J. D. Res.* 11:855 (Dec.) 1931.

and Dobbs,[37] has been reported to be associated with a lowered caries incidence.[36] More recently Manley[38] and Vallotton[39] have described this substance, which they referred to as a pellicle. In a comprehensive study of organic structures of the enamel, Bibby[40] said in summary:

> It has been shown that keratin is a relatively indestructible substance, and that biologically it is destroyed actively only by the action of certain fungi and actinomycetes. By deduction and certain experimental evidence it has been shown that the keratin of the enamel shares this property of resistance to bacterial destruction. In histological preparations the keratinous rod-sheaths have been shown to persist long after the rod substance itself has been destroyed, and have been shown to limit the lateral spread of enamel destruction. Evidence has been presented which suggests that the organic element of the enamel acts as a passive defense against caries.

That caries progresses mainly in the direction of the enamel rods, which was illustrated clearly by Bodecker,[41] is acceptable to both the acidogenic and proteolytic schools. But the depreciatory statements made by Gottlieb concerning the effects of acids in the carious process are disturbing.

Gottlieb[42] has said:

> The fact that carious enamel becomes more resistant to acid action makes the statement inacceptable that caries of enamel results from acid action. According to this finding it must consist of a principle that is quite opposite to acid action and which can only be proteolytic action. The fact that carious enamel is more resistant to acid action than neighboring normal enamel was confirmed and can always be checked with the same result.

Reference was made here to Gottlieb and Stanton's report.[43]

Gottlieb used photographs of a section of enamel[42] to illustrate that after exposure to the action of 0.1 per cent lactic acid for one month, where the acid was changed daily, the brownish discoloration in an intact enamel surface, which he claims indicates caries of the enamel, resisted longer than the non-stained area. He explained in the text,[42] "The bodies of the invading microorganisms, themselves organic, augment the organic content of the enamel and, in this way, increase its resistance of being dissolved by acid."

In 1930 Beust[44] referred to this same phenomenon when he observed, "Such a method attests to the paradoxical fact that carious enamel itself is more resistant to lactic acid decomposition than sound enamel."

Enright and Friesell[45] studied this paradox when they immersed 30 teeth, which had incipient proximal caries at a point where caries is usually found, in normal lactic acid for 24 hours. Beust's statement was found to be true in 26 teeth. This was repeated by exposing 12 teeth with incipient caries to five normal nitric acid for 20 minutes. A sharper projection of the carious area remained again. A tooth showing two of these remaining nobs, one on each proximal surface, was held in a Bunsen flame so that only one of the proximal surfaces was reached directly by the flame. Charring took place at once. After oxidation of the carbonaceous material, the tooth was placed again in the same solution of nitric acid, and the previously insoluble area which had been flamed went into solution quickly while the other nonflamed surface remained intact. This demonstrated that the

37. Dobbs, E. C., Surface Resistance of Human Enamel to Acid Decalcification. *J. D. Res.* 12:581 (Aug.) 1932.

38. Manly, R. S., A Structureless Recurrent Deposit on Teeth. *J. D. Res.* 22:479 (Dec.) 1943.

39. Vallotton, C. F., An Acquired Pigmented Pellicle on the Enamel Surface. I. Review of Literature. II. Clinical and Histologic Studies. III. Chemical Studies. *J. D. Res.* 24:161 (June-Aug.) 1945.

40. Bibby, B. G., The Organic Structure of Dental Enamel as a Passive Defense Against Caries. *J. D. Res.* 12:99 (Feb.) 1932.

41. Bodecker, C. F., The Bacterial Invasion of the Enamel in Dental Caries (Preliminary Communication). *D. Cos.* 69:986 (Oct.) 1927.

42. Gottlieb, B., *Dental Caries.* Philadelphia: Lea and Febiger, 1947.

43. Gottlieb, B. and Stanton, S., Acid Action on Enamel and Dentin. *Texas D. J.* 61:293 (Aug.) 1943.

44. Beust, T. B., Micro-organisms and Caries. *J.A.D.A.*, 17:1536 (Aug.) 1930.

45. Enright, J. J. and Friesell, H. E., Studies of the Cause and Nature of Dental Caries. *J.A.D.A.* 20:897 (May) 1933.

organic material offered an acid insoluble protective coating.

The question arises as to whether these stained teeth were actually the seat of incipient caries, since it was specified that there be "no break in surface continuity." Bibby[30] clarified this situation when he said, "The practice of calling all pigmentations of the enamel 'incipient caries,' appears to be unjustified since many of the processes associated with pigmentation appear to be self-limiting and do not result in extensive destruction of the tooth." Thus, it would seem that the surface alterations of enamel with some decalcification and the formation of pigmented amorphous masses on the outer portion of enamel, through some physicochemical action, result in an organic substance which has a greater resistance to acid action. This is apart from the usual process in which caries continues to disintegrate enamel, and is rather the exceptional course caries may pursue when, for instance, the process is arrested.

Numerous incongruities appear in Gottlieb's book.[42] On page 83 he states, "No acid, regardless of its kind or concentration, can produce necrosis of any tissue."

"Chalky enamel," according to his usage of the term, cannot be identified with caries. Yet Gottlieb admits on page 87 that:

> In the case of the third molar it is probably the cheek which furnishes the protection to the buccal surface of the tooth, so that acid can develop. This is why the chalky strips are found sometimes under denture clasps and why it is recommended that partial dentures be removed overnight in order to disrupt the continuous protection.

Again on page 235, he states:

> Teeth clasped in connection with partial dentures are often destroyed by caries so that after a short time the neighboring tooth must be used. Thus it is claimed that partial dentures are sometimes only a stepstone to full dentures.

On page 236 he says, "It is advisable to impregnate a clasped tooth three times a year."

On page 96 he uses italics to emphasize the point that, "The tenacious plaque does not cause dental caries, but a plaque becomes tenacious after caries has begun." No question can be left in the reader's mind when he states on page 82:

> It may sound ironical, but from the reported observations, the conclusion must be made that acid not only fails to produce caries but is responsible for erecting a barrier against the spread of caries, in the form of transparent enamel. In this sense it may be called the beneficial component of enamel caries.

Gottlieb mentions another "advantage" of the decalcifying action of acids on page 151:

> These signs of acid action are very valuable inasmuch as we do not see the carious process proper in the x-ray. Here again it is indeed fortunate when acid accompanies the carious process, for it not only takes care of walling off the process in the periphery, when present in small quantities, by producing hypercalcification, but it helps to find the caries in the clinical x-ray examination.

In a chapter which describes his technic for caries prophylaxis, the following paragraph appears on page 232:

> The obstruction of the invasion roads by impregnation has the main result in preventing microorganisms from invading. In addition two other results are obtained which are also of major importance. The children are free to consume any sweets they desire. The sweetening of the invasion roads is not any more possible after having them obstructed. They may eat sweets without any harm like children with natural caries immunity, who have their invasion roads obstructed by calcium deposition from the saliva.

Gottlieb's views on his concept of dental caries have appeared widely in several journals.[46, 47, 48, 49, 50, 51] Without

46. Gottlieb, B., A New Concept of the Caries Problem and Its Clinical Application. *J.A.D.A.* 31: 1489 (Nov.); 31:1598 (Dec.) 1944.

47. Ibid., Two Kinds of Undermining Enamel Caries. *J. Den. Res.* 23:169 (June) 1944.

presenting any data, Gottlieb and Hinds,[52] made claims for considerable reduction of acidophilus counts, often to zero, by the use of Septochem. Lazansky[53] could not demonstrate a reduction of caries incidence in hamsters and white rats with the use of two applications of Septochem. "Any effect produced was of an adverse sort," he concluded.

During one year (1947), Gottlieb had recommended four different series of solutions for use in his impregnation technic.[54] His most recently suggested technic can be found in The Texas Dental Journal.[55] Essentially, it consists of successive application of aqueous solutions of zinc chloride (40 per cent) and potassium ferrocyanide (20 per cent) to all teeth and silver nitrate (10 per cent) to the molar teeth, after preliminary cleaning and drying.

In his text he has recommended three tooth impregnations a year for children six to twelve years of age. However, in a communication to the editor of the *Journal of the Canadian Dental Association*,[56] Gottlieb advocated the impregnation of the mouth twice at intervals of a few days to be sure no place has been missed, and he states that between the ages of 6 and 12, "at least three double impregnations a year are necessary." Therefore, by some unexplained equation, certainly not based on practical experience, he has decided that an aggregate of 36 impregnations are necessary during this six-year period.

The clinical evidence gathered up to this present writing will now be outlined. Younger[57] presented data for a group of 30 children between the ages of 5 and 12 who averaged 10.8 cavities per person. All carious surfaces were restored before impregnating. Of 25 individuals whose teeth were impregnated one or more times, only 11 new cavities had developed at the end of one year, as compared with 21 new cavities in the five individuals whose teeth were not impregnated. This type of report, which does not specify the number of impregnations nor the individual caries experience of each subject in this small group with inadequate controls, cannot be considered as sufficient clinical evidence.

Crawford[58] reported on the results of impregnating the teeth of caries active individuals. Of 49 patients who were known to have developed 128 cavities during the first 12 months preceding treatment, 34 were found to have no new cavities and the 15 others had a total of 29 new cavities one year after treatment. Of 32 patients whose records were not kept long enough to know whether or not the observed 123 cavities present at the beginning of the study had all developed during the preceding 12 months, 21 patients were found to have no new cavities, and the 11 others had 15 new cavities among them. The combined figure of a reduction of 82.5 per cent was reported. The age range was given as from 4 to 60 years, but pertinent information relating to the age distribution was not submitted. So confident was this author in this technic's ability to produce perfect results that he listed the reasons why he "missed the 100 per cent mark by a 17.5 per cent margin." In the sum-

48. Ibid., Dental Caries and Related Subjects. *J. Canad. D. A.* 13:467 (Oct.); 13:524 (Nov.) 1947.

49. Gottlieb, B., Diamond, M., and Applebaum, E., The Caries Problem; *Am. J. Orthodont. & Oral Surg.* 32:365 (June) 1946.

50. Gottlieb, B., Caries Prophylaxis by Obstruction of the Invasion Roads. *Am. J. Orthodont. & Oral Surg.* 33:827 (Dec.) 1947.

51. Ibid., Caries Prophylaxis. *Texas D. J.* 65:8, (Jan.) 1947.

52. Gottlieb, B., and Hinds, E., Some New Aspects in Pathology of Dental Caries. *J. D. Res.*, 21:317 (June) 1942. Abstract.

53. Lazansky, J. P., The Effect of Topical "Septochem" Applications on Experimental Caries. *J. D. Res.* 25:21 (Feb.) 1946.

54. Council on Dental Therapeutics: Present Status of Preparations Used in Impregnation for Caries Prophylaxis. *J.A.D.A.*, 38:147 (Jan.) 1949.

55. Gottlieb, B., Details on Impregnation for Caries Prophylaxis According to the Latest Knowledge and Experience. *Texas D. J.* 67:51 (Feb.) 1949.

56. Gottlieb, B., Techniques of Impregnation for Caries Prophylaxis. *J. Canad. D. A.* 13:530 (Oct.) 1947.

57. Younger, H. B., Gottlieb's Caries Prophylaxis. *Texas D. J.* 62:429 (Dec.) 1944.

58. Crawford, H. M., Clinical Results of Impregnation. *Texas D. J.* 67:52 (Feb.) 1949.

mary he stated, "Moisture, the varying resistance of the invasion roads, and the inability to discover the early beginning dentin caries most likely caused the 17.5 per cent failure."

Younger[59] reported on the caries experience of 63 caries-active cases in an age range of 8 to 13 years. These patients had 8 or more cavities at the original examination. The upper right and lower left quadrants were impregnated; the other quadrants were not treated. "Around 75 per cent reduction in caries activity was experienced by this group." On the assumption that the original total number of intact surfaces was the same for each half-mouth treated versus the half-mouth not treated, which was unlikely when consideration is given to individual variations of the number of bilaterally paired permanent teeth which did not erupt at the same time, indefinite figures such as "eight or more cavities" and "around 75 per cent reduction" are included. During this age period (8 to 13), many deciduous teeth are exfoliated, and a study for only one year tends to distort the true picture of caries activity unless the actual number of teeth, whether deciduous or succedaneous, are reported as exposed-to-risk. Therefore, it would have been helpful to know in what manner the number of lost deciduous teeth was entered in these statistics, or at least the number of succedaneous teeth which had not yet erupted during this one-year study.

Conclusion

An attempt has been made to present a documentary summary of the available evidence concerning two popular proposals for the reduction of dental caries. Because of inadequate information, and particularly because of the lack of sufficient clinical evidence, it remains for each one to render his own appraisal of these methods until their true worth is established.—*2085 Adelbert Road.*

59. Younger, H. B., Clinical Results of Caries Prophylaxis by Impregnation; *Texas D. J.* 67:99 (March) 1949.

▲

Three Generations.—At any given period of transition there are always three generations actively in being: the great old men in the heights in the background, still wielding authority from their achievement, and in some cases still achieving; the men in their fifties, sixties, seventies, and even eighties, in the full vigor of their maturity, occupying the middle distance; and the young men in the foreground dreaming and plotting the creation of the future.—*Richard Le Gallienne, "The Romantic '90's."*

A PRELIMINARY STUDY OF THE EFFICIENCY OF PIPEROCAINE HYDROCHLORIDE AS A LOCAL ANESTHETIC IN DENTAL SURGERY

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PIPEROCAINE (Metycaine) hydrochloride has been reported to be as effective as, and in some instances superior to procaine hydrochloride in the various fields of surgery.[1-8] It was first prepared in 1927 and attracted interest because animal studies showed it to be a surface as well as a subcutaneous anesthetic.[9] Like all local anesthetics, piperocaine is a stimulant of the central nervous system. Toxic reactions are manifested by tremors, excitement and dizziness which may progress to convulsions. As with procaine, the immediate administration of a barbiturate by the intravenous or intramuscular route will combat such a reaction. Toxicologic studies indicated that it was more toxic than procaine in rabbits and rats when administered intravenously, but no more toxic than procaine when given to rats subcutaneously.[10] This same study demonstrated piperocaine anesthesia to be of longer duration than procaine anesthesia. Pfeiffer and Grant[11] have shown that 2 per cent procaine and 2 per cent piperocaine are similar in acute toxicity when they are given subcutaneously to the albino Swiss mouse. However, the addition of epinephrine 1:25,000 to the same concentrations of anesthetics resulted in increased toxicity of both solutions, especially the piperocaine (Table 1). Studies of subacute toxicity carried out on dogs demonstrated a better tolerance for procaine than piperocaine.

The prolonged action of piperocaine was confirmed by Meeker[12] using the intradermal wheal method in humans. He concluded that piperocaine produced a complete and lasting anesthesia, was comparable to procaine in toxicity, produced no tissue damage and did not interfere with healing.

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1. Woodbridge, P. D., Neothesin for Spinal and Regional Anesthesia. *Anesth. & Analg.* 11:177 (July-Aug.) 1932.

2. *Ibid*, Important Minor Points in Local Anesthesia. *Canad. M. A. J.* 38:216 (March) 1938.

3. *Ibid*, Metycaine Spinal Anesthesia: Report of 1,381 Cases. *Am. J. Surg.* 37:191 (Aug.) 1937.

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Table 1.—Comparison of toxicity[12]

Solution	LD-50 (mg./kg.)
Procaine 2%	569
Piperocaine 2%	570
Procaine 2% with epinephrine 1:25,000	427
Piperocaine 2% with epinephrine 1:25,000	285

Solutions injected subcutaneously in albino Swiss mice.

Lundy[8] has pointed out that procaine and piperocaine can be used interchangeably, but that if more profound anesthesia is preferred, as in nerve surgery, or dental surgery, involving exposed or abscessed teeth, piperocaine is preferable. He and Tuohy have also found, from suitable skin tests, that piperocaine may be used on patients sensitive to procaine.[5,7,8]

In a study of procaine-sulfonamide antagonism conducted on guinea pigs, Pfeiffer and Grant[11] found that procaine, used locally or parentally, counteracted the therapeutic effects of locally applied sulfathiazole. They found no inhibition of sulfonamide activity resulting from the similar use of piperocaine. It was their conclusion that piperocaine was the best suitable substitute for procaine at present.

Henshaw, Gregory and Werkman[13] studied the records of 1,500 patients reveiving piperocaine for all types of dental operations at Indiana University Dental School and reported on the findings in 322 of them. They found the anesthesia was sufficient for all types of work, no toxic reactions occurred, and no dermatitides were attributable to the anesthetic.

In order to evaluate further the efficiency of piperocaine, the present study was made for the purpose of comparing its action with that of procaine and directing attention toward the comparative speeds of onset and duration of anesthesia, toxic reactions and degree of effectiveness.

Methods

The study was conducted on 57 patients of as nearly consecutive admissions as the demand for clinical facilities permitted. If several visits were required to complete a patient's surgery, an effort was made to keep him in the experimental group.

Two solutions, piperocaine 2 per cent with epinephrine 1:60,000, and procaine 2 per cent with epinephrine 1:50,000, were used for comparison. The solutions were prepared in similar bottles, coded by the hospital pharmacy but unknown to the operator. The assistant in the clinic filled the syringes out of sight of the operator and recorded in a data book the code of the solution used as well as the date and unit number of the patient. All observations, injections and extractions were performed by one person. This served to standardize injection technics and eliminate variation in observations.

The following information was recorded before the injections: date, name, unit number, sex, age, color and nationality, pulse, blood pressure and respirations. Color and nationality were included because the clinic serves many people of foreign birth who cling to old beliefs and are very excitable.

The time of injection was recorded as was also the type of injection, amount of solution and time of onset of anesthesia. If premedication had been taken by the patient, the type and amount were recorded. Note was also made of any pain on injection not associated with the insertion of the needle. About three minutes

13. Henshaw, F. R., Gregory, G. T., and Werkman, H. P., A Local Anesthetic Applicable to All Phases of Dental Work. *Med. Arts & Indianapolis M. J.* 34:640 (Oct.) 1931.

after injection, blood pressure, pulse and respiratory rates were recorded. At the same time, systemic reactions were recorded if present. When supplemental injections were required to obtain deeper anesthesia, the quantity used and the time from the second injection to the time when work could proceed were recorded.

Following the operation, the type of work done, bleeding and amount of trauma were included in the record with a notation of the operator's opinion of the anesthesia.

Space limitations and clinic routine did not permit the patients to remain for observation and the majority would not return for routine checks. Additional information regarding the postoperative course as well as duration of anesthesia was obtained by giving each patient an addressed postcard bearing his name, unit number and date with the following questions: (1) About how long did the numbness last? (2) Was there any swelling of your face? (3) Did the socket bleed —much, little, not at all—that first evening? (4) Was the socket—very painful, slightly painful, not painful at all—that night? (5) Do you feel the anesthesia for your extraction was satisfactory?

Results and Discussion

In spite of the small number of individuals included in the study, the groups were well balanced (Table 2) and it was not necessary to correlate color, nationality, sex and age with other findings.

Inspection of the records of pulse and respiratory rates and blood pressure showed nothing that could be correlated with the types of solutions used. Comparison of pre- and post-injection records revealed no consistent set of responses; variations were many. It was observed that if any pre-injection datum was extremely high or low it tended to seek the normal range following injection. A majority of the individuals receiving injections on separate days seemed to show decrease in pulse, blood pressure and occasionally in respirations on the succeeding visits.

The patients were often upset about the first visit, but either reconciled themselves to the operation or their fears of a great pain were dispelled by the first operation. In addition, the application of a blood pressure cuff and observation of pulse rate were not routine procedures in this clinic and may have served as a disturbing factor on the first visit. This observation of differences between first and succeeding visits suggested that the initial visits of all patients should be disregarded and only succeeding observations included in such a study. This was not done in our study, because a large

Table 2.—Color, nationality, sex and age range

	Piperocaine		Procaine	
	No. of injections	% injections	No. of injections	% injections
Color				
Caucasoid	48	84.2	35	83.3
Negroid	5	8.8	5	11.9
Mongoloid	4	7.0	2	4.8
Nationality				
American	38	66.6	31	73.8
Italian	13	22.8	9	21.4
American Indian	4	7.0	2	4.8
German	1	1.8	0	0.0
Spanish	1	1.8	0	0.0
Sex				
Male	30	52.6	22	52.4
Female	27	47.4	20	47.6
Age Range				
1–10	0	0.0	0	0.0
11–20	8	14.0	4	9.5
21–30	13	22.8	9	21.4
31–40	6	10.6	7	16.7
41–50	7	12.3	5	11.9
51–60	2	3.5	4	9.5
61–70	19	33.3	12	28.6
71–80	0	0.0	1	2.4
81–90	2	3.5	0	0.0

portion of the data was accumulated on patients making only one visit.

Premedication had been used by only two individuals, both of whom received subsequent injections without premedication. The succeeding observations of these individuals were similar in character to the first observations and for that reason the premedications were discounted in tabulating the data.

There was no observable difference between piperocaine and procaine regarding onset of anesthesia. This might be due to the variability of patients' subjective interpretations of pain and pressure. The type of injection was recorded (Table 3, A) and found to have a similar distribution for both solutions. The type of injection did not seem to have any correlation with onset of anesthesia. It was expected that patients would notice more rapid onset following infiltration, but the records did not bear this out. Again this may be the result of inability to differentiate between pain and pressure.

Table 3.—Injections

	Piperocaine		Procaine	
	No. of injections	% injections	No. of injections	% injections
A. Types				
Tuberosity	9	16.1	12	28.6
Mandibular block	27	48.2	16	38.1
Infraorbital	7	12.5	7	16.6
Infiltration	10	17.8	6	14.3
Mental	2	3.6	0	0.0
Mandibular block plus infiltration	0	0.0	1	2.4
Infiltration plus tuberosity	1	1.8	0	0.0
B. Pain on injection	7	12.5	3	7.1
C. Requiring second injection	5	8.9	4	9.5
D. Quality of anesthesia				
Satisfactory	50	87.7	38	95.0
Poor	7	12.3	4	5.0

Table 4.—Systemic reactions

	Piperocaine		Procaine	
	No. of injections	% injections	No. of injections	% injections
Tremor				
None	39	68.4	32	76.2
Slight	16	28.1	6	14.3
Moderate	2	3.5	4	9.5
Sweating				
None	46	80.7	33	78.6
Slight	10	17.5	6	14.3
Moderate	1	1.8	3	7.1
Nervousness				
None	32	56.1	27	64.3
Slight	17	29.8	11	26.2
Moderate	3	5.3	4	9.5
Extreme	5	8.8	0	0.0
Faintness				
None	54	94.7	42	100.0
Present	3	5.3	0	0.0

The amount of solution used was 3 cc. The patients requiring supplemental injections, five piperocaine and four procaine (Table 3, C), received 1.5 cc. in the area of the initial injection and 1.5 cc. infiltrated about the area to be operated on. The only explanation for the necessity of the second injections is faulty technic, since several of the patients were injected previously, subsequently, or both, without difficulty.

The occurrence of pain on injection (Table 3, B) was recorded if the patient volunteered the information. It was found that all would say "yes" if asked immediately after the injection was complete but would say "no" if asked again when leaving. For this reason it was necessary to use care in questioning patients, since leading or suggestive questions biased the results. If the patients were aware that a study was being conducted, they tended to answer in great detail and in a way they thought would be most helpful. Lit-

tle significance is attached to the fact that pain at injection was slightly more common in the piperocaine group.

Systemic reactions evidenced by tremor, sweating, nervousness and faintness could have been recorded as present in various degrees in all patients entering the clinic. In making the observations, these symptoms were indicated as present only if they increased after injection (Table 4). The results in the two groups were similar.

Upon completion of the extractions, the teeth removed, amount of bleeding, and amount of trauma were recorded. No great differences were found between the solutions with regard to bleeding (Table 5, A). In evaluating the bleeding it was necessary to consider the amount of trauma and any systemic disturbance. The one case in which the bleeding was excessive was that of an alcoholic patient with cirrhosis of the liver.

In several cases in which bleeding was moderate, the patients were found to have elevated blood pressure. An interesting observation was that high blood pressure was found in some people who did not seem nervous and excitable and who showed no tendency to bleed, whereas those with high blood pressure and who did bleed were the nervous, excitable type.

The operator's opinion of anesthetic quality (Table 3, D) was tempered by such factors as uncooperative or frightened patients and faulty injection technics. The observations demonstrate no significant difference between piperocaine and procaine in this respect.

In general the patients were very cooperative in completing and returning the questionnaires. One hundred and three were given out and 74 were returned. The returns from the cards were entered on large record sheets and correlated with the amount of trauma and location and number of teeth removed. It was found that complaints of pain and swelling could be attributed to the extraction procedures and did not appear to be related to the type of anesthetic agents used.

Eight patients returned with dry sockets (Table 5, B), four of which were in the region of lower third molars, and the remainder were in various locations. The number of dry sockets occurring with the two solutions was the same.

In determining the duration of anesthesia, the patients were asked to note the time when the numbness, which was first noticed after injection, passed off. Almost all replied by stating the time in hours or quarterly subdivisions thereof. This was to be expected, for there is no clear-cut end point as the anesthesia fades. Tabulation of the durations (Fig.

Table 5.—Postoperative findings

	Piperocaine		Procaine	
	No. of injections	% injections	No. of injections	% injections
A. Immediate				
Bleeding:				
Slight	46	80.7	37	88.1
Moderate	10	17.5	5	11.9
Excessive	1	1.8	0	0.0
Trauma:				
None	45	78.9	31	73.8
Slight	9	15.8	7	16.6
Moderate	2	3.5	2	4.8
Excessive	1	1.8	2	4.8
B. After 24 hours:				
Pain:				
None	25	54.3	19	58.0
Slight	13	28.3	8	24.0
Moderate	3	6.5	1	3.0
Excessive	5	10.9	5	15.0
Swelling:				
None	28	60.7	24	72.7
Slight	15	32.6	7	21.2
Moderate	2	4.3	2	6.1
Large	1	2.2	0	0.0
Dry socket:				
None	42	92.0	29	87.9
Present	4	8.0	4	12.1

1) showed the frequency peak for procaine to be between one and one and one-half hours. The average duration was 2.15 hours with a standard deviation of 1.5. The frequency peak for piperocaine was reached at 2 hours with average duration of 2.73 hours and a standard deviation of 1.3. The critical ratio of the two means was 5.6, indicating that the difference is real and not due to chance. Thus, it would seem that the duration of anesthesia from piperocaine 2 per cent with epinephrine 1:60,000 is longer than that of procaine 2 per cent with epinephrine 1:50,000.

Comments

Further work should be done with piperocaine to determine whether people who cannot receive or handle procaine hydrochloride are also sensitive to piperocaine. It would be a great advantage to such individuals to have an anesthetic available which is so similar to procaine in its actions.

It would be interesting to conduct a similar study on patients undergoing operative dentistry, for it is well known that surgery can sometimes be performed at a level of anesthesia where operative work can not. Lundy has recommended the use of piperocaine in work requiring profound anesthesia, and this study has demonstrated the longer duration of anesthesia resulting from its use. Thus, it would seem to be an excellent anesthetic agent for use in operative procedures as well as in dental surgery.

More accurate data regarding the short time interval between injection and onset might have been obtained by use of Woolf's light beam or a condenser discharge method. Both can be better con-

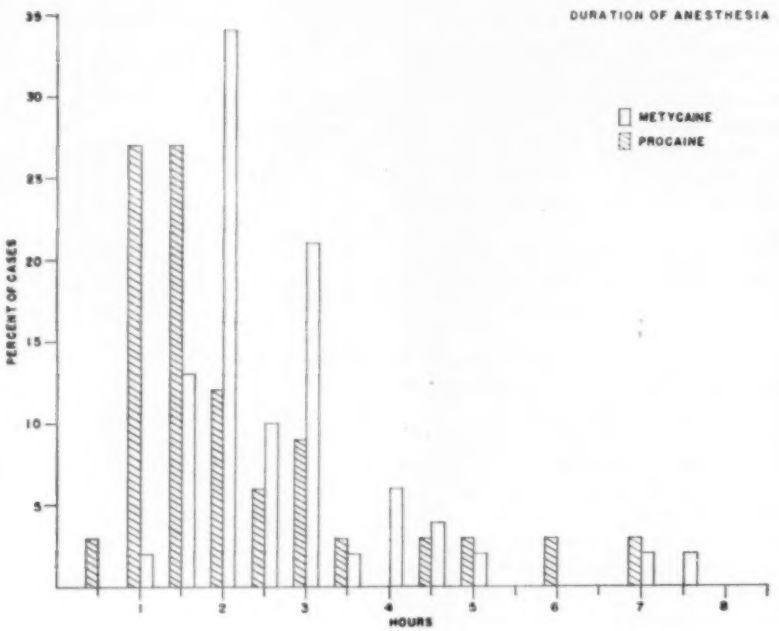

Figure 1.—Duration of Anesthesia

trolled than the usual mechanical stimuli, and they can be calibrated to the individual's pain threshold.

Summary

A preliminary study of the comparative anesthetic actions of piperocaine 2 per cent with epinephrine 1:60,000, and procaine 2 per cent with epinephrine 1:50,000, revealed no significant differences in rate of onset, resulting toxic reactions, or regularity of effectiveness, but did show that anesthesia produced by piperocaine was of longer duration.—*260 Crittenden Blvd.*

THE SYNERGISTIC EFFECT OF PENICILLIN—STREPTOMYCIN AND ITS APPLICATION IN THE TREATMENT OF INFECTED PULPLESS TEETH

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It has long been recognized that synergistic effects can be produced when two or more drugs are combined. For example, mercurial and arsenical compounds, when used in the treatment of syphilis, react more efficiently in combination than when used separately. In recent years, with the introduction of sulfonamides, it has been shown that a combination of two or three sulfonamides will enhance the bacteriostatic action of each drug and also reduce its toxicity.[1] Ungar,[2] Soo-Hoo and Schnitzer[3] have shown that a combination of para-aminobenzoic acid, sulfapyridine and penicillin was found to demonstrate a synergistic effect in certain infections. This effect was exerted not only *in vitro* but also *in vivo*.

Bondi and Dietz, working in Kolmer's laboratory,[4] demonstrated by serial dilution that 0.2 unit of penicillin was the smallest amount which would inhibit the H strain of *Staphylococcus aureus*, whereas the minimal amount of streptomycin accomplishing inhibition was 1 unit. In a mixture of the two compounds, however, the minimal amount was 0.05 unit of penicillin and 0.5 unit of streptomycin, indicating a slight degree of synergistic action.

Recently Price and coworkers[5] have demonstrated both a synergistic and antagonistic action *in vivo* by inoculating mice with *Salmonella typhosa*. They showed that by injecting 20 units of penicillin 2 per cent of the mice were pro-

1. Lehr, D., Inhibition of Drug Precipitation in Urinary Tract by Use of Sulfonamide Mixtures; Sulfathiazole-Sulfadiazine Mixture. *Proc. Soc. Exper. Biol. & Med.* 58:11 (Jan.) 1945.

2. Ungar, J., Synergistic Effect of Para-Aminobenzoic Acid and Sulfapyridine on Penicillin. *Nature.* 152:245 (Aug.) 1943.

3. Soo-Hoo, G., and Schnitzer, R. J., Activity of Penicillin Combined with Other Anti-Streptococcal Agents Towards B-Hemolytic Streptococci in Vitro. *Arch. Biochem.* 5:99 (Sept.) 1944.

4. Kolmer, J., The Synergistic or Additive Activity of Chemotherapeutic Compounds. *Am. J. M. Sc.* 215:136 (Feb.) 1948.

5. Price, C. W., Randall, W. A., Welch, H., Candbert, V. L., Synergistic Action of Antibiotics in Experimental Infection. Delivered at Laboratory Section, 76th Annual Meeting Am. Pub. Health Assn., November, 1948.

tected; when 2 micrograms of streptomycin was used 33 per cent were protected. Yet when a combination of 20 units of penicillin and 2 micrograms of streptomycin was used there was only 5 per cent protection, displaying an antagonistic action. When the penicillin dosage was increased to 200 units, 16 per cent of the mice survived and when 200 units of penicillin was combined with 2 micrograms of streptomycin there was an 88 per cent protection, showing a definite synergistic action.

The advantage of two or more drugs in root canal therapy to produce a synergistic effect has not been amply demonstrated. Potkin,[6] however, using the agar plate technic, demonstrated that penicillin and beechwood creosote together produced a greater zone of inhibition than either penicillin or beechwood creosote alone. Ross[7] advocated the use of chloroazodin with sulfanilamide in the treatment of a pulpless tooth. Pear[8] reported excellent clinical results, on the basis of culture, using penicillin and streptomycin. Recently Grossman,[9,10] advocated the use of penicillin and streptomycin in oil for treatment of infected root canals. The results have been the most promising of any drugs used up to the present time. The primary reason for the use of the combination of the two antibiotics was specificity of action, *i.e.*, penicillin to destroy the gram-positive organisms and streptomycin the gram-negative organisms.

Whether specificity alone was the factor responsible for giving such excellent results merited an investigation.

Experimental Study

The following study was made to determine: (1) the effect of penicillin and streptomycin, individually and in combination, on a strain of *Staph. aureus* and a streptococcus strain belonging to the Viridans group, and (2) whether the two antibiotics can demonstrate a synergistic effect.

Method A.—*Staph. aureus* (209) and a streptococcus strain of the Viridans group were inoculated individually into flasks containing 100 ml. of Difco brain heart infusion broth. These were incubated for 24 hours. A 0.5 ml. amount of the 24-hour growth was then seeded into tubes containing 4 ml. of Difco brain heart infusion broth. Dilutions of 0.5 ml. of penicillin (sodium), streptomycin (calcium chloride complex) and a combination of the two antibiotics were added to the seeded tubes making a 1:10 dilution of the bacteria employed. These were incubated for 24 hours at 37° C.

The dilutions of the antibiotics were prepared in the following manner: Streptomycin was supplied by the Sharp & Dohme Laboratories in 1-gram vials. Each microgram of streptomycin was equivalent to 1 unit. Ten milliliters of sterile Difco brain heart infusion broth was added to the vial so that each milliliter contained 0.1 Gm. of streptomycin. Dilutions were then prepared so that when 0.5 ml. of streptomycin was added to 4.5 ml. volume (4 ml. of Difco brain heart infusion broth and 0.5 ml. of the 24-hour growth), each milliliter contained the following concentration of streptomycin:

1st tube contained 10,000 μg/ml
2nd tube contained 1,000 μg/ml
3rd tube contained 500 μg/ml
4th tube contained 100 μg/ml
5th tube contained 50 μg/ml
6th tube contained 25 μg/ml
7th tube contained 10 μg/ml
8th tube contained 2 μg/ml

6. Potkin, M. N., The Use of Penicillin Treatment of the Mixture Canal. *J.A.D.A.* 34:459 (April) 1947.

7. Ross, H. J., Root Canal Sterilization with the Synergistic Mixture of Azochloramide and Sulfanilamide. *J.A.D.A.* 31:1341 (Oct.) 1944.

8. Pear, J. R., Preliminary Case Reports and Technic on the Treatment of Apical Infections with Penicillin and Streptomycin. *J. Endodontia.* 1:32 (Sept.) 1946.

9. Grossman, L. I., Treatment of Infected Pulpless Teeth with Penicillin. *J.A.D.A.* 37:141 (Aug.) 1948.

10. *Idem*, Preliminary Report on the Use of a Penicillin-Streptomycin Suspension in Endodontia, *J. Endodontia*, 3:39 (July) 1948.

The same procedure was followed when penicillin was tested. When the combination of penicillin and streptomycin was used only 3.5 ml. of Difco brain heart infusion broth was inoculated in the tube so that the final volume was 5 ml. in all tests.

The eight tubes for each test were then incubated for 24 hours at 37° C.

The same procedure of testing the antibiotics was repeated upon a mixture of the *Staph. aureus* (209) and the streptococcus by adding 0.25 ml. of a 24-hour growth of each organism to 4 ml. of Difco brain heart infusion broth. The 0.5 ml. of each antibiotic and combination of antibiotics was then added to the mixed organisms.

Subcultures were made by transferring 0.1 ml. of the 24-hour specimen to a flask containing 100 ml. of Difco brain heart infusion broth to which penicillinase had been added. The amount of penicillinase added was four times the calculated amount of transferred penicillin, *i.e.*, for each unit of penicillin 4 units of penicillinase was added to the flask. This was incubated for 24 hours and readings were taken. The fact that the broth did not display growth macroscopically, as evidenced by the flasks remaining clear, indicated a bactericidal action. All negative flasks were incubated for 10 days before final readings were made.

Results.—The results showed that streptomycin had no bactericidal effect on *Staph. aureus*, while greater than 100 and less than 500 units per milliliter of penicillin was able to kill the test organism. When a combination of penicillin and streptomycin was used, these antibiotics were able to destroy the organism with greater than 10 and less than 25 units per milliliter of each (Table 1). Actually it was a total greater than 20 and less than 50 units per milliliter of antibiotic because an equal amount of each was used.

From the results it can be noted that the combined units of penicillin and streptomycin were less than the sum of the component parts. This may be an important consideration from the standpoint of toxicity or sensitivity if large doses have to be used.

When the same procedure was repeated upon the streptococcus, streptomycin had little effect on the tested organism whereas penicillin was able to destroy it at greater than 10 and less than 25 units per milliliter. When the combination of the two antibiotics was employed it did not enhance the bactericidal action. It killed the organism at the same level as penicillin alone, demonstrating no additive action. This may be attributed to the fact that this particular strain of streptococcus was more susceptible than *Staph. aureus* to penicillin.

When the same procedure was repeated upon a mixture of equal parts of streptococcus and *Staph. aureus* (0.25 ml. of each), streptomycin had no effect but penicillin exhibited bactericidal action at greater than 10 and less than 25 units per milliliter. The fact that less penicillin was needed to kill the mixture of organisms may be attributed to the presence of fewer staphylococci which were more resistant to penicillin than streptococci. When a combination of the two antibiotics was employed, the results were slightly different. Whereas penicillin was able to destroy both the *Staph. aureus* and streptococci at the same level, more units of each antibiotic were needed in concentrations of greater than 25 and less than 50 units per milliliter to kill the organisms when they were mixed. This may be suggestive of interference of antibiotic action in mixed infections or antagonistic effect when a lower unitage was used.

Method B.—The paper disk plate method was applied to examine the zones of inhibition with the respective antibiotics. The technic consisted in the use of disks of filter paper, 5.5 mm. in diameter,

punched from Whatman no. 2 filter paper by means of an ordinary paper punch, sterilized in a hot air oven at 180° C. The disks were then impregnated with the solutions to be tested. They were completely dried on a glass slide for one-half hour at 37° C., and then were placed flat on the surface of a Difco brain heart infusion agar plate inoculated with *Staph. aureus* (209). Small tissue forceps, kept sterile by heating in an open flame, were used to transfer the disks from the test solutions to sterile slides for drying and subsequently to the agar surfaces.

The following solutions were tested on the same agar plate: 25 units of penicillin per milliliter, 25 micrograms of streptomycin per milliliter, the combination of penicillin and streptomycin at the foregoing concentration, penicillin 50 units per milliliter and streptomycin 50 micrograms per milliliter. A disk with no medicament was employed as a control. These were incubated for seven days at 37° C.

Results.—The paper disk plate method showed greater zones of inhibition with the combined drugs than individually when 25 units per milliliter of penicillin and 25 micrograms of streptomycin was used, but not if 50 units per milliliter of penicillin was used alone. Both the 25 and 50 micrograms per milliliter of streptomycin produced only a very slight amount of inhibition.

Discussion

In root canal therapy, we are primarily concerned with destroying all bacteria. Therefore a bactericidal technic was de-

Table 1.—The effect of penicillin-streptomycin upon a 1:10 dilution of staphylococcuss aureus (209), streptococcus (viridans group) and a mixture of the two organisms

Units of penicillin; micrograms of streptomycin	Streptomycin			Penicillin			Penicillin and streptomycin			Units of penicillinase
	S. A.	S. V.	S. A. & S. V.	S. A.	S. V.	S. A. & S. V.	S. A.	S. V.	S. A. & S. V.	
10,000	+	0	+	0	0	0	–	0	0	40
1,000	+	+	+	0	0	0	–	0	0	4
500	+	+	+	0	0	0	0	0	0	2
100	+	+	+	+	0	0	0	0	0	0.4
50	+	+	+	+	0	0	0	0	0	0.2
25	+	+	+	+	0	0	0	0	+	0.1
10	+	+	+	+	+	+	+	+	+	0.04
2	+	+	+	+	+	+	+	+	+	0.008

S. A. = *Staph. aureus.*
S. V. = Streptococcus (Viridans group).
\+ = Growth within 10 days at 37° C.
0 = No growth within 10 days at 37° C.
– = Not tested at that dilution.
1 unit of streptomycin = 1 μg.
1 unit of penicillin = 0.6 μg.

sirable since the root canal of a pulpless tooth is devoid of body defenses. Although the serial dilution plating method may give a quantitative determination of the number of organisms present, it measures only the degree of bacteriostasis. Tulacek and Tilden[11] also believed that bactericidal rather than bacteriostatic action of disinfectants or antibiotics is to be sought in the treatment of pulpless teeth. It is believed that Method A, used in the foregoing test, approximated the *in vivo* conditions of the root canal more closely than any other method. Also medicaments which have a low rate of diffusion can be evaluated better by this method than by the agar diffusion method.

In this series of experiments, Difco brain heart infusion broth was used since it supported the growth of *Staph. aureus* and because its phosphate content inhibited the *in vitro* action of streptomycin. It has been shown that streptomycin activity is diminished by the presence of glucose, phosphates, cevitamic acid, peptones and certain sulfahydryl compounds.[12] It has also been shown that 10 ml. of brain heart infusion broth neutralizes the antibacterial effect of about 75 to 100 micrograms of streptomycin.[13] Penicillin was inactivated by the addition of penicillinase. Since the two antibiotics were inactivated, the results indicate that the effect was bactericidal rather than bacteriostatic.

Despite the fact that streptomycin may have been inactivated (in the test tube) in the lower unitage, it was shown that penicillin and streptomycin combined had a more powerful bactericidal action upon *Staph. aureus* than had penicillin alone. The inactivation, however, may not have been immediate because a certain time would have had to elapse and during that interval the combined compounds may have exercised their antibacterial properties.

The findings point to a synergistic or additive effect when penicillin was used in combination with streptomycin against *Staph. aureus*. Whereas greater than 100 units and less than 500 units of penicillin was necessary to kill *Staph. aureus*, the combined antibiotics needed only greater than 10 and less than 25 units of each to accomplish the same result.

When a streptococcus belonging to the Viridans group was used, there was no demonstrable synergistic effect and, when the organisms were combined and tested with the combination of the antibiotics, there was an effect suggestive of antagonism. Whereas greater than 10 and less than 25 units per milliliter of penicillin was necessary to destroy the combined organisms, the combination of the two antibiotics needed greater than 25 and less than 50 units per milliliter of each to exert a bactericidal action. This suggested that in mixed infections, if low concentrations of the combined antibiotics were used, an antagonistic effect might arise. The antagonism, however, could be overcome by increasing the unitage of the two antibiotics.

Gram-positive and gram-negative organisms are present in the root canal of infected pulpless teeth. It has been shown that the presence of gram-negative organisms inactivated penicillin and also increased the resistance of the gram-positive organism.[14,15] Rammelkamp[16] demonstrated that in mixed infections the gram-negative organisms protected the gram-positive organism by inactivating

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the gram-positive antagonists. *In vitro* experiments by Klein[17,18] demonstrated that, although resistance of *Staph. aureus* and *E. coli* to streptomycin developed rapidly when streptomycin was used alone, this did not occur when streptomycin was used with penicillin. Therefore, it is imperative that a drug such as streptomycin be incorporated to prevent the inactivation of penicillin by specifically eliminating the gram-negative organisms in mixed infections of the root canal.

It appears from our investigations that synergism, as well as specificity of action of penicillin and streptomycin, can enhance our clinical results.

Summary

Under *in vitro* conditions, using a bactericidal technic, the action of penicillin was enhanced in the presence of streptomycin against *Staph. aureus* (209). There was no additive action against a certain strain of streptococcus. When the bacteria were mixed in equal amounts there was an antagonistic effect in the lower unitage. Streptomycin should be incorporated with penicillin to prevent the inactivation of penicillin by specifically eliminating the gram-negative organisms in mixed infections of the root canal. Synergism as well as specificity of action of penicillin and streptomycin can enhance our clinical results in the treatment of the infected pulpless teeth.—*1551 Champlost Avenue.*

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Importance of Imaginative Thinking.—The bias which arises from unrecognized personal attitudes, interests, and preconceptions is the most treacherous of all the subversive enemies of sound scientific progress; yet these attitudes and interests are the key factors in all really original scientific investigation. This issue must be faced frankly and courageously. The easy way out is to ignore the troublesome personal ingredients of the problem and say that science has no concern with them. This is now generally regarded as the standard or normal scientific method. But actually this cannot be done, and we cannot afford to try to do it; for the interests and the attitudes of the inquirer shape the whole course of the investigation, without which it is meaningless and fruitless. To neglect these components of scientific work and the satisfactions of a successful outcome is to sterilize not only the process but also the results of the inquiry. The vital germ of untrammeled imaginative thinking is thrown into the discard, and too often we seem quite content with the dead husk which is so easily weighed, measured, classified, and then stowed away in the warehouse.—*C. J. Herrick, "George Ellett Coghill," Chicago: Univ. Chicago Press, 1949; quoted by Hadley Cantril, Adelbert Ames, Jr., Albert H. Hastorf and William H. Ittelson, "Psychology and Scientific Research. III. The Transactional View in Psychological Research," Science 110:520, November 18, 1949.*

GINGIVAL DISEASE IN THE VIRGIN ISLANDS

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FOLLOWING A comprehensive survey of dental conditions in Puerto Rico, the opportunity was taken to extend our investigations to the nearby Virgin Islands.

The Virgin Islands of the United States of America, consisting of the islands of St. Thomas, St. John and St. Croix, and about 50 uninhabited islands and cays, lie 40 miles east of Puerto Rico and 1,400 miles southeast of New York. They are about 18 degrees north of the Equator, 64 degrees west of Greenwich and lie in the chain of Caribbean islands between the Atlantic Ocean and the Caribbean Sea.

The Virgin Islands are of volcanic origin with mountain ridges from 500 to 1,500 feet high. On St. Thomas and St. John the ridges slope steeply on both sides to the sea leaving only small pockets of land suitable for cultivation. More gradual slopes on the island of St. Croix make agriculture possible.

The climate of the Virgin Islands is semitropical, temperatures ranging from a low of 69 degrees in winter to a high of 91 degrees in summer. The average annual rainfall is 46 inches of which about 45 per cent occurs during the last four months of the year. Of the occasional West Indian hurricanes, the Virgin Islands have experienced only three in the last 40 years.

The present investigation was confined to the island of St. Thomas which occupies 28 square miles of the total area of the Virgin Islands (132 square miles). According to the latest census, the total population of the Virgin Islands was 24,889, that of St. Thomas being 11,265 of which 9,801 are urban and only 1,464 rural.

According to the racial classification used in the 1940 census, 2,236 or 9 per cent were white; 17,176 or 69 per cent were Negroes; 5,477 or 22 per cent were classified as "mixed or other." According to the same census figures, 10,361 or 41.7 per cent of the total population were under 20 years of age.

There are no figures available for the per capita income, but a study being made now would seem to indicate that, for the year 1946, the average per family per annum income is approximately $400. The basic industry, sugar cultivation, is almost entirely confined to the island of St. Croix. The principal occupations of St. Thomas are the servicing of ships, the manufacture of rum and bay rum, cattle raising, truck gardening, deep sea commercial fishing, handicraft industries and the tourist trade. Much of the food consumed on the islands is imported.

The death rate was 16.1 per thousand and the birth rate 39.9 in the year 1945. The infant mortality rate was 109.9 per thousand as compared with 101.2 in 1944 and 83.3 in 1943. Apparent causes are congenital debility, respiratory diseases,

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Table I.—Type and degree of gingival disease

Age group	Number in group	Acute					Subacute					Chronic					Number with gingival disease	Total disease figure
		1+	2+	3+	Total	Disease figure	1+	2+	3+	Total	Disease figure	1+	2+	3+	Total	Disease figure		
6	96	1	–	–	1	0.010	5	2	–	7	0.09	24	8	–	32	0.41	40	0.52
8	143	2	–	–	2	0.014	16	5	–	21	0.18	37	10	3	50	0.46	73	0.66
10	123	3	–	–	3	0.024	14	7	–	21	0.23	36	12	1	49	0.51	73	0.76
12	157	1	1	1	3	0.038	25	12	2	39	0.35	35	21	2	58	0.53	100	0.92
14	157	2	2	–	4	0.038	20	11	8	39	0.42	42	14	4	60	0.52	103	0.98
16	103	–	1	–	1	0.019	16	5	–	21	0.25	21	10	4	35	0.51	57	0.79
18	44	–	–	–	–	—	3	6	1	10	0.41	10	3	1	14	0.43	24	0.84
6-18	823	9	4	1	14	0.024	99	48	11	158	0.28	205	78	15	298	0.49	470	0.79

Key: 1+ — slight; 2+ — Moderate; 3+ — Severe.

gastro-intestinal infections and malnutrition.

The Virgin Islands appeared of particular interest for purposes of an oral epidemiologic survey because of the predominantly Negro population, the comparatively low economic level of the population and, from the viewpoint of dental caries incidence, because of the complete dependence of the people on rain water from roofs and catchment areas for drinking purposes.

The present report deals with the observations in relation to gingival disease on the island of St. Thomas. Dental caries will be the subject of a separate report.

Material and Method

A total of 823 children and adolescents were examined with mouth mirror and explorer in a good natural light. The ages selected were 6, 8, 10, 12, 14, 16 and 18 years. On the basis of the present school enrolment, it is estimated that this sample represents one in five of the whole school-going population of the island of St. Thomas, and one in three of the school population of the ages selected. Since over 96 per cent of the island population between the ages of 5½ and 14 years are enrolled (with a decreasing percentage in the higher age groups), it is apparent that the sampling is representative of the child and adolescent population as a whole.

As an additional safeguard against unfair sampling, the examination was spread over four different schools: two public primary-elementary schools (Washington and Lincoln), one private elementary school (Catholic), and the Charlotte Amalie High School.

Clinical experience and information gained from earlier investigations of this kind[1, 2, 3] have led to the opinion that it is unsafe to rely on data obtained from one region of the mouth as an index of the gingival condition of the mouth as a whole. Regions most favored in past sur-

Table 2.—Gingival status, males and females

Age group	Number of subjects	Number of males	Number of females	Per cent with gingival disease			Gingival status, males and females (per cent)			
				Males	Females	Total	Normal	Acute	Subacute	Chronic
6	96	44	52	36.36	46.15	41.67	58.33	1.04	7.29	33.33
8	143	57	86	57.89	46.51	51.05	48.95	1.40	14.69	34.97
10	123	57	66	64.91	54.55	59.35	40.65	2.44	17.07	39.84
12	157	54	103	72.22	59.22	63.69	36.31	1.91	24.84	36.94
14	157	78	79	69.23	62.03	65.61	34.39	2.55	24.84	38.22
16	103	47	56	57.45	53.57	55.34	44.66	0.97	20.39	33.98
18	44	27	17	55.56	52.94	54.55	45.45	—	22.73	31.82
6–18	823	364	459	60.71	54.25	57.11	42.89	1.70	19.20	36.21

veys have been the upper labial and lower labial regions (cuspid to cuspid). For this reason and for purposes of more detailed study, the gingival condition of six regions were examined individually: the upper labial, lower labial, upper buccal, lower buccal, palatal and lingual regions. A quantitative evaluation of the severity of gingival disturbances was made and recorded for each region separately. Numerical values, (0, 1^+, 2^+, 3^+), were assigned to each area to designate the severity of the gingival lesion.

A similar procedure was followed in relation to calculus deposition for the purpose of studying the relationship between the incidence of gingival disease and the presence or absence of calculus in each region of the mouth. In all cases, a differentiation was made between supragingival and subgingival calculus.

The difficulties in assessing gingival lesions in terms of acute, subacute and

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2. Day, C. D. Marshall-, and Tandan, G. C., The Incidence of Dental Caries in the Punjab. *Brit. D. J.* 69:381 (Dec. 2) 1940.

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Table 3.—Prevalence of proliferation, edema, ulceration and suppuration

Age group	Proliferation			Edema			Ulceration			Proliferation and edema	Proliferation and ulceration	Edema and ulceration	Proliferation, edema and ulceration	Suppuration		
	1+	2+	3+	1+	2+	3+	1+	2+	3+					1+	2+	3+
6	25	8	–	–	–	–	–	–	–	5	1	—	1	–	–	–
8	26	6	3	4	1	–	1	–	–	12	13	2	5	–	–	–
10	32	9	1	2	–	–	2	–	–	17	7	1	2	–	–	–
12	29	18	1	4	–	–	–	–	–	10	22	3	13	2	–	–
14	33	11	3	3	–	–	1	–	–	21	15	2	14	10	–	–
16	21	10	3	4	–	–	–	–	–	13	1	1	4	5	2	–
18	10	4	–	1	1	–	–	–	–	3	2	2	1	–	–	–
6–18	176	66	11	18	2	–	4	–	–	81	61	11	40	17	2	–

Table 4.—Regional

Age group	Number of subjects	Labial								Buccal	
		Upper				Lower				Upper	
		1+	2+	3+	Total	1+	2+	3+	Total	1+	2+
6	96	29	11	—	40	25	8	—	33	22	3
8	143	52	14	3	69	45	10	1	56	43	6
10	123	50	18	1	69	39	11	—	50	40	7
12	157	57	32	4	93	50	19	5	74	65	17
14	157	59	27	9	95	58	22	8	88	59	24
16	103	32	15	3	50	29	15	4	48	32	11
18	44	12	10	1	23	13	6	2	21	11	9
6-18	823	291	127	21	439	259	91	20	370	272	77

chronic phases of disease are not discounted. This is particularly true of the intermediate or subacute phase. In recording this differentiation, due regard was given to color, contour and texture of the gingiva, and the presence or absence of stippling and glazing of the tissue surface. In the absence of acute symptoms, the proliferative type was recorded as belonging to the chronic phase of gingival disease.

The presence or absence and degree of proliferation, edema, ulceration and suppuration were noted separately. The incidence and degree of epithelial pigmentation of the gum surface were also recorded.

Results and Discussion

General Incidence of Gingival Disease.—Table 1 shows the incidence of gingival disease in the seven age groups examined between the ages of 6 and 18 inclusive. As already stated, with a full realization of the difficulties involved in using such a classification for active and changing disease processes, an effort has been made to differentiate the acute, subacute and chronic phases of the disease according to the predominant characteristics of each case. Clinical differences in color, degree of glazing, contour and texture are frequently difficult to evaluate with any degree of accuracy, particularly where cases are found in an intermediate stage between acute and subacute and subacute and chronic phases. Not infrequently also an acute condition may become superimposed upon a long-standing chronic state. In relation to this general, and admittedly somewhat arbitrary, classification it should be stated that cases of proliferative gingivitis not occurring during the eruptive period of the associated teeth, or showing proliferation in excess of what might reasonably be considered normal or physiologic for this period, have been classified as chronic gingivitis. The gingival status for each phase was recorded as normal, slight, moderate or severe (0, 1^+, 2^+, 3^+).

As will be seen from Table 1, 470 of the total of 823 subjects examined showed gingival disease of varying types and degree. Of the 470 cases with gingival disease, 63.40 per cent were recorded as chronic, 33.62 per cent as subacute, and only 2.98 per cent as acute gingivitis. The "disease figure" or average degree per subject in each age group was obtained by summating the numbers designating the degree of severity and dividing by the number in each group. The final column in the table represents the total disease figure for each group re-

distribution of disease

Buccal						Palatal				Lingual			
Upper		Lower											
3+	Total	1+	2+	3+	Total	1+	2+	3+	Total	1+	2+	3+	Total
—	25	12	1	—	13	12	—	—	12	8	—	—	8
1	50	33	1	—	34	22	2	—	24	21	1	—	22
1	48	24	1	—	25	16	1	—	17	15	1	—	16
1	83	41	7	—	48	35	3	—	38	37	1	—	38
4	87	41	7	1	49	37	3	—	40	34	7	—	41
2	45	22	4	1	27	18	5	—	23	19	5	—	24
—	20	7	5	—	12	10	2	—	12	7	3	1	11
9	358	180	26	2	208	150	16	—	166	141	18	1	160

gardless of type. It was found that the disease figure for the acute, subacute and chronic phases of gingival disease and the total disease figure for all phases steadily increased from 6 to 14 years of age, and that the disease was at its maximum at the ages of 12 to 14 years corresponding with the age of puberty.

Table 2 shows the gingival status of males and females separately and together, recorded in terms of percentages of the total number examined. In all age groups but one (6 years) the males showed a higher percentage with gingival disease. Of the total number examined the males (60.71 per cent) showed a significantly higher percentage with gingival disease than the females (54.25 per cent). Of the 823 subjects examined, 42.89 per cent were recorded as normal and 1.70, 19.20 and 36.21 per cent as acute, subacute and chronic respectively. Thus, from a representative sampling of the island population from 6 to 18 years, the incidence of gingival disease, of various types and varying degree, was found to be 57.11 per cent.

A further analysis of the data (Table 3) shows the relative frequency of occurrence of proliferation, edema, ulceration, both singly and in combination, and of suppuration. It was found that proliferation occurred alone or in combination with edema and/or ulceration in 435 or 52.86 per cent of the subjects examined; edema occurred alone or in combination with one or both in 152 or 18.47 per cent; ulceration occurred alone or in combination in 116 or 14.09 per cent of the subjects. Evidence of suppuration was found in 19 or only 2.31 per cent of the subjects and was confined to the 12, 14 and 16 year age groups.

Regional Distribution of Gingival Disease. —Clinical experience and earlier periodontal studies have cast some doubt on the advisability of relying upon data obtained from any one region of the mouth as an index of the gingival status of the mouth as a whole. It is well known that certain areas of the mouth are involved more frequently than others, but many unusual variations occur in individual mouths in relation to regional involvement and degree of gingival disease. It was, therefore, decided to record the distribution and degree of gingival disease in the six regions: upper and lower labial, upper and lower buccal, palatal and lingual. The results are set out in Table 4. It is evident that the region most commonly affected is the upper labial and in descending order of frequency, the lower labial, upper buccal, lower buccal, palatal and lingual. This order is maintained

in all age groups except with regard to the relative frequency of involvement of the palatal and lingual regions. In the older age groups (14, 16, 18) the lingual replaces the palatal region in order of frequency. This order is entirely maintained when the average degree of gingivitis, or disease figure, is calculated by the usual method for each region (Table 5). In Table 6 a gingival disease figure has been

Table 5.—Gingival disease figure for each region

Age group	Number of subjects	Labial		Buccal		Palatal	Lingual
		Upper	Lower	Upper	Lower		
6	96	0.53	0.43	0.29	0.15	0.13	0.08
8	143	0.62	0.48	0.41	0.24	0.18	0.16
10	123	0.72	0.49	0.46	0.21	0.15	0.14
12	157	0.85	0.66	0.65	0.35	0.26	0.25
14	157	0.89	0.80	0.76	0.37	0.27	0.31
16	103	0.69	0.69	0.58	0.32	0.27	0.28
18	44	0.80	0.70	0.66	0.39	0.32	0.36
6–18	823	0.74	0.61	0.55	0.29	0.22	0.22

Table 6.—Gingival disease figure, by summation of numbers designating degree of involvement in each region

Age group	Number of subjects	Number of males	Number of females	Gingival disease score			Gingival disease figure		
				Males	Females	Total	Males	Females	Total
6	96	44	52	51	104	155	1.16	2.00	1.62
8	143	57	86	145	155	300	2.54	1.80	2.10
10	123	57	66	137	127	264	2.40	1.92	2.15
12	157	54	103	229	233	462	4.24	2.26	2.94
14	157	78	79	298	237	535	3.82	3.00	3.41
16	103	47	56	142	150	292	3.02	2.68	2.83
18	44	27	17	100	42	142	3.70	2.47	3.23
6–18	823	364	459	1102	1048	2150	3.03	2.28	2.61

Table 7.—Percentage of subjects with calculus

Age group	Number of males	Number of females	Number of subjects calculus-free		Percentage with calculus		
			Males	Females	Males	Females	Males and females
6	44	52	40	50	9.09	3.84	6.25
8	57	86	45	77	21.05	10.47	14.69
10	57	66	43	55	24.56	16.67	20.33
12	54	103	25	69	53.70	33.01	40.13
14	78	79	38	30	51.28	62.03	56.69
16	47	56	18	26	61.70	53.57	57.28
18	27	17	8	8	70.37	52.94	63.64
6–18	364	459	217	315	40.38	31.37	35.36

Table 8.—Calculus figure according to type and degree

Age group	Number of subjects	Calculus score			Calculus figure		
		Supra-gingival	Sub-gingival	Both	Supra-gingival	Sub-gingival	Both
6	96	7	—	7	0.07	—	0.07
8	143	19	9	28	0.13	0.06	0.20
10	123	27	6	33	0.22	0.05	0.27
12	157	123	62	185	0.78	0.39	1.18
14	157	164	106	270	1.04	0.68	1.72
16	103	131	91	222	1.27	0.88	2.16
18	44	79	59	138	1.80	1.34	3.14
6–18	823	550	333	883	0.67	0.40	1.07

calculated from the numbers designating the degree of involvement in each region. The same general trends are evident.

The upper and lower labial regions[4] and lower labial region[5] have been used by investigators as an index of the general gingival condition of the mouth. A detailed analysis of the data in this investigation shows that in 24 cases no signs of disease could be found in the upper labial region while one or several other regions were affected, sometimes to a severe degree; and in 91, or over 11 per cent of the 823 subjects examined, one or more other regions were affected, from a slight to a severe degree, while no detectable disease was encountered in the lower labial region. These observations were spread over all age groups. Also, the variations in degree of gingival disease between different regions in the same mouth are frequently very great. On the basis of these observations the lower labial region particularly would have been an unfortunate choice as an index of the general gingival status in the present investigation.

Comparative Distribution of Calculus and Gingival Disease.—In view of the controversial state of the literature in relation to the mechanism of calculus deposition and its relative importance in periodontal disease, it seemed desirable to investigate the incidence of calculus deposition in the various age groups and its distribution in the different regions of the mouth, with the object of making a comparative

4. King, J. D., Gingival Disease in Dundee. *D. Record* 65:9 (Jan.); 30 (Feb.); 55 (March) 1945.

5. Schour, Isaac, and Massler, M., Gingival Disease in Postwar Italy. *J.A.D.A.* 35:475 (Oct. 1) 1947.

Table 9.—Frequency distribution of calculus

Surfaces	Age group (years)							Total
	6	8	10	12	14	16	18	
Upper buccal	6	18	23	51	77	47	24	246
Lingual	—	2	—	26	38	30	19	115
Lower labial	—	2	2	23	32	26	14	99
Lower buccal	1	2	2	11	14	13	9	52
Upper labial	—	—	1	7	10	9	3	30
Palatal	—	1	—	6	9	8	4	28

Table 10.—Calculus distribution

Age group	Number of subjects	Labial												Buccal		
		Upper						Lower						Upper		
		Supragingival			Subgingival			Supragingival			Subgingival			Supragingival		
		1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+
6	96	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–
8	143	–	–	–	–	–	–	1	–	–	1	–	–	14	–	–
10	123	–	–	–	1	–	–	–	–	–	2	–	–	19	3	–
12	157	–	–	–	6	1	–	8	2	1	18	3	–	32	17	1
14	157	2	–	–	10	–	–	5	10	–	24	2	–	55	13	3
16	103	1	–	–	8	1	–	11	1	–	22	1	–	26	17	1
18	44	–	–	–	1	2	–	8	–	1	6	3	1	12	5	4
6–18	823	3	–	–	26	4	–	33	13	2	73	9	1	164	55	9

study of the regional distribution of calculus and gingival disease.

Table 7 shows a steady increase in the percentage of subjects with calculus deposits from the age of 6 years (6.25 per cent) to 18 years (63.64 per cent). The female subjects showed a maximum calculus deposition at the age of 14 years. In all but the 14 year age group, there was a significantly higher percentage with calculus among the males. The total percentage figure for all age groups was significantly higher in the case of the male subjects (40.38:31.37).

Differentiation was made between supragingival and subgingival calculus, and in order to obtain a quantitative evaluation, the amount present in each case was graded numerically. In this way a "calculus figure" or average degree of deposition per subject was obtained. The findings are consolidated in Table 8. With advance in age, there was found to be an increase in both supragingival and subgingival calculus figures, and a relatively greater proportion of subgingival calculus. The subgingival calculus figure was greater than the supragingival figure in the upper and lower labial and palatal regions but less in the other three regions. For all age groups combined, the supragingival and subgingival calculus figures were 0.67 and 0.40 respectively. It must be remembered, of course, that supragingival and subgingival calculus frequently occurred in association. The frequency with which calculus was found on the various tooth surfaces is set out in Table 9. It will be noted that essentially the same order was maintained in all age groups, and that the order in relation to regional involvement is by no means the same as for gingival disease. Table 10 shows the distribution of calculus according to type and degree in the six regions examined.

Tables 11, 12 and 13 show the prevalence of gingival disease and calculus deposition of both types in each of the regions studied. An analysis of the data shows that of a total of 4,938 regions examined, 1,701 were recorded as having gingival disease from a slight to a severe degree. In contrast with this number of diseased areas, only 429 or 25.22 per cent were found in association with supragingival calculus, and only 570 or 33.51 per cent in association with calculus of any kind (11.54 per cent of the 4,938 areas examined). Subgingival calculus occurred more frequently than the supragingival type in the upper labial, lower labial

according to type and degree

Buccal									Palatal						Lingual					
Upper			Lower																	
Sub-gingival			Supra-gingival			Sub-gingival			Supra-gingival			Sub-gingival			Supra-gingival			Sub-gingival		
1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+
–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4	1	–	2	–	–	–	–	–	–	–	–	1	–	–	2	–	–	1	–	–
3	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
16	–	–	8	–	–	3	–	–	5	–	–	1	–	–	18	4	–	10	–	–
37	–	–	8	1	–	5	–	–	2	–	–	6	1	–	28	2	1	18	–	–
22	1	–	6	3	–	5	1	–	4	1	–	5	–	–	23	2	1	19	1	–
10	3	–	4	–	2	6	1	–	2	–	–	3	–	–	14	4	–	10	1	–
92	5	–	31	4	2	19	2	–	13	1	–	16	1	–	85	12	2	58	2	–

and palatal regions, and supragingival calculus was more prevalent than the subgingival type in the upper buccal, lower buccal and lingual regions. It is worthy of note that the upper labial region with much the greatest incidence of disease of all areas (439 of 823 upper labial regions examined) showed supragingival calculus deposits in only 3 areas and even here it was at the same time in association with subgingival deposits which are generally conceded to be a product of the disease. From these figures it seems obvious that calculus must play but a negligible role in gingival disease in the age groups under review.

The Incidence of Pigmentation.—Because the population of St. Thomas, in common with the rest of the Virgin Islands, is predominantly Negro, we recorded the presence and degree of epithelial pigmentation on the gingival surface. Pigmentation is common in such ethnic groups, and was also encountered in our surveys in India. This pigmentation, ranging from black to light brown in color, either as a continuous dark band or in patches, is usually more pronounced in and confined to the anterior part of the mouth. It occurs more commonly on the attached gingiva, but not infrequently extends as far as the gingival papilla. This anomaly may be so extensive as to minimize the value of color changes as criteria for disease and to make the utilization of pressure recovery tests of still more doubtful value. These observations are recorded in Table 14. There would seem to be no significant correlation between age and incidence or degree of pigmentation except perhaps in the age groups below 10 years; nor was there any significant difference in incidence or degree between males and females. An interesting comparison may be made between the high incidence of pigmentation recorded (83.48 per cent) and the 1940 census figure for the nonwhite population (91 per cent).

Summary

The incidence of gingival disease was investigated in primary-elementary and secondary school children of the ages of 6 to 18 in the Virgin Islands. The sample of over 800 examined constituted approximately one in five of the school-going predominantly Negro population of the island of St. Thomas, and one in three of the school-going children in the age

Table 11.—Comparative distribution of gingival disease and calculus (labial)

Age group	Number of subjects	Labial							
		Upper				Lower			
		Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)	Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)
6	96	40	—	—	—	33	—	—	—
8	143	69	—	—	—	56	1	1	2
10	123	69	—	1	1	50	—	2	2
12	157	93	—	7	7	74	11	21	23
14	157	95	2	10	10	88	15	26	32
16	103	50	1	9	9	48	12	23	26
18	44	23	—	3	3	21	9	10	14
6–18	823	439	3	30	30	370	48	83	99

Table 12.—Comparative distribution of gingival disease and calculus (buccal)

Age group	Number of subjects	Buccal							
		Upper				Lower			
		Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)	Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)
6	96	25	6	—	6	13	1	—	1
8	143	50	14	5	18	34	2	—	2
10	123	48	22	3	23	25	2	—	2
12	157	83	50	16	51	48	8	3	11
14	157	87	71	37	77	49	9	5	14
16	103	45	44	23	47	27	9	6	13
18	44	20	21	13	24	12	6	7	9
6–18	823	358	228	97	246	208	37	21	52

Table 13.—Comparative distribution of gingival disease and calculus (palatal and lingual)

Age group	Number of subjects	Palatal				Lingual			
		Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)	Number disease areas	Number with supra-gingival calculus	Number with sub-gingival calculus	Number with calculus (supra, sub or both)
6	96	12	—	—	—	8	—	—	—
8	143	24	—	1	1	22	2	1	2
10	123	17	—	—	—	16	—	—	—
12	157	38	5	1	6	38	22	10	26
14	157	40	2	7	9	41	31	18	38
16	103	23	5	5	8	24	26	20	30
18	44	12	2	3	4	11	18	11	19
6–18	823	166	14	17	28	160	99	60	115

Table 14.—Incidence of gingival pigmentation

Age group	Number of subjects	Number showing pigmentation	Per cent with pigmentation	Pigmentation degree				Pigmentation score	Pigmentation figure
				Slight	Moderate	Severe	Very severe		
6	96	65	67.71	15	18	27	5	152	1.58
8	143	119	83.22	31	46	34	8	257	1.79
10	123	103	83.74	21	33	44	5	239	1.94
12	157	134	85.35	41	32	55	6	294	1.87
14	157	133	84.71	25	45	45	18	322	2.05
16	103	94	91.26	18	30	32	14	230	2.23
18	44	39	88.64	11	13	12	3	85	1.93
6–18	823	687	83.48	162	217	249	59	1579	1.92

groups examined. No evidence of gross malnutrition was encountered, but in view of the low economic status of the population (average per family per annum income approximately $400), subclinical malnutrition might well have been present. Analysis of the data disclosed:

1. The incidence of gingival disease of various types and varying degree in the 823 subjects examined was 57.11 per cent.

2. The incidence and severity of disease increased with age, reaching a peak (63.69 to 65.61 per cent) at the age of puberty (12 to 14 years). The males (60.71 per cent) showed a significantly higher incidence than the females (54.25).

3. In descending order of frequency the regions of the mouth most commonly affected were the upper labial, lower labial, upper buccal, lower buccal, palatal and lingual, with the lingual tending to replace the palatal region in the older age groups.

4. A study of the regional distribution of disease emphasized the danger in using one region of the mouth (lower labial or upper labial) as an index of the general condition of the mouth.

5. A study of the regional distribution of calculus and gingival disease indicated that calculus plays only a negligible role in gingival disease in the age groups examined.

6. The occurrence of epithelial pigmentation on the gingival surface of 83.48 per cent of the subjects examined afforded an interesting comparison with the 1940 census figures of 91 per cent for the nonwhite population of the islands, and might well serve as a useful racial index in anthropologic surveys.

▲

Homage to Wisdom.—Thinking is the bravest of all activities. People will do anything to avoid thought, even go to the source of it to snatch a few epigrams so that they shouldn't have to think. Quotation is the homage paid by the ignorant to wisdom.—*George Bernard Shaw in "Days with Bernard Shaw," by Stephen Winsten.*

AMERICAN DENTAL ASSOCIATION SPECIFICATION NO. 9 FOR DENTAL SILICATE CEMENT: FIRST REVISION, EFFECTIVE JULY 1, 1950

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THE formulation and revision of the official specifications of the American Dental Association for dental materials is one of the major objectives of the cooperative research between the National Bureau of Standards and the Council on Research. This revision of the American Dental Association Specification No. 9 for Dental Silicate Cement[1] is the first revision of an official specification since the war began in 1941. It is contemplated that all of the American Dental Association specifications will be revised within the next few years.—*Council on Dental Research.*

During the decade 1938 to 1948, no outstanding developments were made in silicate cements. Some minor improvements occurred such as lowering of solubilities, increasing of compressive strength, higher purity and adjustments in opacities. Therefore, this revision of the specification for silicate cement does not involve major alterations.

The principal changes are:

1. The minimum value for compressive strength is increased from 1,260 Kg. per square centimeter (approximately 18,000 pounds per square inch) to 1,620 Kg. per square centimeter (approximately 23,000 pounds per square inch) and at the same time the age of the specimens is reduced from 1 week to 24 hours.

2. The maximum allowable value for solubility and disintegration is reduced from 2 per cent to 1.4 per cent and at the same time the age of the specimens is reduced from 1 week to 24 hours.

3. A system of sampling is prescribed whereby a composite sample is prepared of various shades and lots. Thus a large uniform sample is obtained.

4. Drawings of some of the required apparatus, and a more precise description of test procedures than in the current specification, are included in the sections on preparation of test specimens, testing consistency, time of setting, compressive strength, and solubility and disintegration.

5. The general requirement that the cements shall not evolve gas is deleted because none of the silicate cements tested during the last 15 years showed this defect. The other general requirement that the cement shall not discolor tooth structure is dropped as no satisfactory laboratory test has been devised to determine whether a cement will or will not discolor.

6. Formerly the directions of the manufacturer for the preparation of test speci-

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1. Paffenbarger, Geo. C., Schoonover, I. C., and Souder, Wilmer, Dental Silicate Cements: Physical and Chemical Properties and a Specification. *J.A.D.A.* 25:32 (Jan.) 1938.

mens were used. They were not always sufficiently precise to insure reasonable uniformity among test specimens. Therefore, precise directions are included as a part of the revised specification.

Consistency of Mix

In the evaluation of silicate cements by means of physical and chemical tests, it is imperative that a definite powder-liquid ratio be employed because values for the physical properties vary with the consistency of the mix used in making the specimen. The consistency used in both the current and the revised specification is an average consistency used by dentists. Some manufacturers thought that this consistency was too thin, that it penalized a cement with a viscous liquid, and that optimum values for the pertinent physical properties were not developed at the standard testing consistency. These manufacturers desired that either a thicker consistency be specified or that each manufacturer specify a definite powder-liquid ratio. In evaluating such suggestions, one should recall that the American Dental Association specifications are not designed to test the materials under optimum conditions of use but under average or even abusive conditions. It is also desirable, if practicable, to have uniform conditions of test so that products may be compared. Then too, if a thicker consistency were used, most of the values for the physical properties would be correspondingly raised or lowered as the case may be. This would neither better the testing procedure nor prescribe a superior type of cement.

Regardless of such academic arguments, it was decided to experiment with modifications of the present consistency test. A 6,000 Gm. load was substituted for the currently used 2,500 Gm. load keeping the diameter of the disk at 25 ± 1 mm. For each of the cements tested, approximately 0.1 Gm. more powder could be combined with 0.4 ml. of liquid to produce a mix of standard testing consistency when using the 6,000 Gm. load instead of the standard 2,500 Gm. load. This heavier mix was more difficult to manipulate and to reproduce uniformly than the slightly thinner consistency. Since these two disadvantages are not counterbalanced by any benefits, it was decided to leave the test for standard consistency unchanged. Before this decision was made, final additional tests, to determine what is the average consistency of mix used by dentists, were conducted through the cooperation of 28 naval dental officers.

In these tests[2] part of a weighed amount of powder of one silicate cement was mixed with 0.4 ml. of liquid until the cement reached a consistency which the officer considered proper. The original amount of powder was in excess so that all of it could not possibly be incorporated into 0.4 ml. of liquid. The difference between the weight of the original amount of powder and the weight of that remaining on the slab was the amount used by the officer in the mix of his choice of consistency. The average for the 28 officers was 1.50 Gm. (average deviation) ± 0.06 Gm. of powder in 0.4 ml. of liquid. The standard consistency test gave a value of 1.50 Gm. in 0.4 ml. of liquid on the same lot number of this brand of cement.

A Comparison of Methods of Preparing Test Specimens

Some objections to specifying the mixing technic used in preparing the test specimens were made. It was contended that the short mixing time, the rapid incorporation of the powder, the smooth glass mixing slab and metal spatula all resulted in a lower powder-liquid ratio

2. Paffenbarger, Geo. C., Silicate Cement: An Investigation by a Group of Practicing Dentists Under Direction of the A.D.A. Research Fellowship at the National Bureau of Standards. *J.A.D.A.* 27:1611 (Oct.) 1940.

for some cements. Mixes were made using a recommended nonspecification technic and a disk 17 mm. in diameter was obtained when a powder-liquid ratio of 1.45 Gm. per 0.4 ml. was used. When the specification technic was used, a disk diameter of 25 mm. was obtained on the same powder-liquid ratio showing that more powder could be incorporated when the technic prescribed in the specification was used.

American Dental Association Specification No. 9 For Dental Silicate Cement First Revision

Effective July 1, 1950

A. Applicable Specifications

A-1. There are no other American Dental Association Specifications applicable to this specification.

B. Types, Grades and Classes

B-1. Type.—Only one type of cement is specified.

B-2. Shade.—Shades of the set cement shall be specified by the purchaser.

C. Material and Workmanship

C-1. Material.—This specification is for dental cement which is to be used primarily for restorations in the anterior teeth. The cement shall consist of a powder and a liquid which, when mixed in the usual dental manner on a glass slab with a spatula, will harden and set.

C-2. Workmanship.—Workmanship shall be first-class throughout. Powders, liquids and their containers shall be free from defects which detract from their appearance or impair their serviceability.

D. General Requirements

See Section E.

E. Detail Requirements

E-1. Liquid.—The liquid shall be water-clear and there shall be no deposits or sediment on the inside of the glass container.

E-1a.—Liquid shall be supplied in an amount 20 per cent in excess of that necessary to combine with the total amount of powder in a bottle of full portion size (usually approximately 14 Gm.) when mixed to testing consistency.

E-2. Powder.—The powder shall be free of extraneous material such as dirt and lint. The pigment shall be uniformly dispersed throughout the powder.

E-3. Cement.—The cement, when spatulated as hereinafter directed, shall not form lumps or granules.

E-3a. Testing Consistency.—The testing consistency shall be the grams of powder combined with 0.4 ml. of liquid required to produce a disk 25 ± 1 mm. in diameter, as described in Paragraph F-3.

E-3b. Time of Setting.—The time of setting shall be not less than 3 nor more than 8 minutes.

E-3c. Compressive Strength.—The compressive strength shall be not less than 1,620 Kg. per square centimeter (approximately 23,000 pounds per square inch) for specimens crushed 24 hours after mixing.

E-3d. Opacity.—The opacity, represented by the contrast ratio $C_{0.70}$, shall be not less than 0.35 nor more than 0.55, 24 hours after mixing. The contrast ratio, $C_{0.70}$, is the ratio between the daylight apparent reflectance of the cement specimen (1 mm. in thickness) when backed by a black backing and the daylight apparent reflectance of the specimen when backed by a white backing having a daylight apparent reflectance of 70 per cent relative to magnesium oxide (MgO).

E-3e. Solubility and Disintegration.—The solubility and disintegration of the cement shall be not more than 1.4 per cent by weight when immersed for 24 hours in distilled water at 37° C. (99° F.).

E-3f. Arsenic Content.—The water soluble arsenic content of the mixed cement shall be not more than one part in 500,000 (0.0002 per cent by weight).

E-3g. Instructions.—Instructions for proportioning and manipulation shall include information regarding the temperature of the slab, the powder-liquid

ratio, the rate of incorporating the powder and the time of mixing.

F. Methods of Sampling, Inspection, and Tests

F-1. Sampling.—Three bottles of powder of each of the six lightest shades (18 bottles in all) on the manufacturer's shade guide, together with a corresponding number of bottles of liquid, shall be procured on the open retail market. (The American Dental Association, by reason of its responsibility for testing certified products, must test all shades. Obviously an agency purchasing only one shade need test only the shade being purchased. In such instances ten bottles of liquid and powder should be sufficient for all tests necessary.)

F-1a. Pooling of Liquids.—If the liquid complies with the requirements of paragraph E-1, the contents of the bottles of liquid shall be emptied into a clean glass-stoppered bottle.

F-1b. Pooling of Powders.—If the powder complies with the requirements of paragraph E-2, the contents of the eighteen bottles of powder shall be emptied into a square-sided jar having a capacity of one-half gallon and a self-sealing cap. The jar shall be rotated on its minor axis for two hours at the rate of 25 revolutions per minute.

F-1c. Composite Samples.—All tests, with the exception of those prescribed in paragraphs E-1 and E-2, shall be conducted on specimens made from the composite samples of liquid and powder specified in paragraphs F-1a and F-1b respectively.

F-2. Preparation of Test Specimens.—The preparation of all test specimens shall be conducted at a temperature between 18 and 24° C. (64 and 75° F.), and at a relative humidity between 55 and 75 per cent. The powder-liquid ratio shall be determined by the consistency test. The following mixing technic shall be employed in the preparation of all test specimens: The glass slab shall be approximately 6 inches long and 3 inches wide. The spatula, made of material not corroded by the cement, and the slab shall be clean and free from hardened particles of cement. The mixing time shall be one minute. A mass of powder, approximately one-half of the total amount, shall be drawn into the liquid and spatulated for 15 seconds. Another portion, approximately one-fourth of the total amount, shall be incorporated in the following 15 seconds. The remaining one-quarter portion shall be incorporated in 15 seconds. Then the whole mass shall be spatulated for the remaining 15 seconds. Approximately one-third of the top surface of the slab shall be used. No particles of powder or any unused liquid shall remain on the slab when the mixing is completed. A linear and not a rotary motion of the spatula should be used, with the edge of the spatula sweeping approximately one-half of the mixing area of the slab on each stroke.

F-3. Testing Consistency.—The type of apparatus for measuring consistency shall be essentially that shown in Figure 1. This apparatus consists of two flat glass plates, a weight, a gage plug and a glass tube (inside diameter approximately 10 mm. [0.39 inch]) which will deliver 0.5 ml. of mixed cement. The combined weight of the top plate and the weight shall be 2,500 Gm. (5.51 pounds).

Trial amounts of powder shall be mixed with 0.4 ml. of liquid. Then 0.5 ml. of each mix shall be delivered from the glass tube onto a flat glass plate. Two minutes after the mixing is started, the top glass plate, weighing approximately 20 Gm., and the necessary additional weight required to total 2,500 Gm. (5.51 pounds), shall be carefully lowered onto the soft cement. Trials shall be made until the average of the major and minor diameters of the slumped mass of cement is 25 ± 1 mm. (0.98 inch) ten minutes after starting the mix. The average weight of powder used in three such determinations rounded off to the nearest 0.05 Gm., combined with 0.4 ml. of liquid, shall be by definition the testing consistency or amount of powder necessary to produce a mix of standard consistency.

F-4. Time of Setting.—A type of apparatus found suitable for determining the time of setting is shown in Figure 2. A brass ring held at room temperature and approximately 4.8 mm. ($\frac{3}{16}$ inch) high

and 11.1 mm. ($\frac{7}{16}$ inch) outside diameter and 9.5 mm. ($\frac{3}{8}$ inch) internal diameter shall be placed on a flat glass plate and filled with cement of standard consistency. Two minutes after starting the mix, the specimen shall be transferred to an atmosphere of 100 per cent relative humidity at 37° C. (99° F.). Two and a half minutes after beginning the mix, a standard Gillmore needle, weighing 453.6 Gm. (1 pound) and having an end 1.06 mm. (0.0417 inch) in diameter, shall be lowered vertically until the surface of the cement is touched. This shall be repeated at 30 second intervals. The time of setting is the number of minutes elapsed from the starting of the mix to the time when the needle fails to make a perceptible circle on the surface of the specimen. The setting time shall be reported to the nearest minute.

F-5. Compressive Strength.—The test specimens shall be cylinders 12 mm. (0.472 inch) high and 6 mm. (0.236 inch) in diameter. The ends of the specimens shall be flat and smooth and shall be parallel to each other and at right angles to the long axis of the cylinder.

An apparatus found convenient for forming these test cylinders is shown in Figure 3.

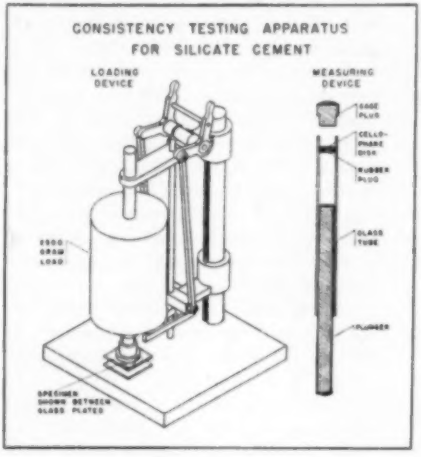


Fig. 1.—Consistency testing apparatus for silicate cements

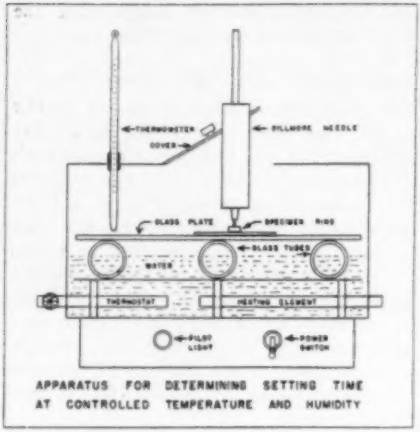


Fig. 2.—Apparatus for determining setting time at controlled temperature and humidity

A cylindrical mold 12 mm. (0.472 inch) high and 6 mm. (0.236 inch) in diameter shall be placed on a flat glass plate and slightly overfilled with cement of standard consistency. A second flat glass plate shall be pressed on top of the mold. The mold and plates shall be held firmly together with a small C clamp. All apparatus shall be at room temperature. The molds shall be made of hard rubber, glass, stainless steel or any other substance which will not react with the cement. The molds may be coated with a 3 per cent solution of a microcrystalline wax (melting point 91—86° C. [196—187° F.]) in benzene. Three minutes after starting the mix, the mold and clamp shall be transferred to an atmosphere of 100 per cent relative humidity at 37° C. (99° F.) (Fig. 2). One hour later the ends of the cylinder shall be surfaced plane at right angles to the axis. The ends of the specimens may be ground flat by the use of a small amount of silicon carbide powder (200 mesh) or other abrasive, and water. The molds containing the specimens shall be drawn back and forth across a glass plate coated with the abrasive and water. They shall be rotated about one-fourth turn every few strokes. The test specimens shall be kept wet during the grinding.

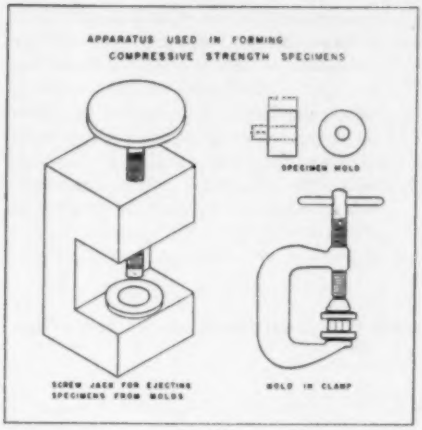


Fig. 3.—Apparatus used in forming compressive strength specimens

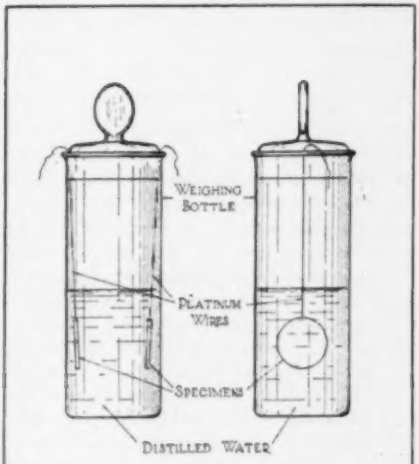
After surfacing, the specimens may be removed from the mold by the screw jack (Fig. 3) and shall be immersed in distilled water at 37° C. (99° F.). The time lapse between the starting of the mixing and the crushing shall be 24 hours. The specimens shall be loaded at the rate of 500 pounds a minute and shall be kept wet during the test.

The value for compressive strength shall be reported as the average of three or more from a lot of five specimens and shall be rounded off to the nearest 10 Kg. per square centimeter. If the values for individual specimens fall more than 15 per cent below the average of the five, they shall be discarded and the average of the remaining specimens shall be reported. In case more than two of the specimens are eliminated, the test shall be repeated.

F-6. Opacity.—A sufficient amount of cement of standard consistency shall be pressed between two flat glass plates to form a disk of cement approximately 3 cm. (1.2 inch) in diameter and 1 ± 0.025 mm. (0.039 ± 0.001 inch) thick. Three minutes after the mix is started, the plates and cement shall be placed for one hour in an atmosphere having a relative humidity of 100 per cent at 37° C. (99° F.). The specimen shall then be removed from the plates and stored for 23 hours in distilled water at 37° C. (99° F.).

A comparison of the opacities of the cement specimen and two opal glass standards, with $C_{0.70}$ values of 0.35 and 0.55 respectively, shall be made by placing the specimen and standards against a variegated black and white background. A film of distilled water shall cover the cement specimens and the standards and also the space between them and the black and white backing during observations. In comparing the opacity ($C_{0.70}$) of a cement with that of a glass standard the uncertainty should not exceed ± 0.02. If the opacity of the specimen is between the opacities of the standards, the cement shall comply with this requirement.

F-7. Solubility and Disintegration.—One-



WEIGHING BOTTLE CONTAINING SOLUBILITY SPECIMENS OF SILICATE CEMENT

Fig. 4.—Weighing bottle containing solubility specimens of silicate cement

half milliliter of cement of standard consistency shall be pressed between two flat plates until the specimen is 20 mm. (0.79 inch) in diameter. A piece of fine platinum or corrosion-resistant wire shall be placed in the soft cement as the specimens are formed to provide a convenient means of holding the specimens. Three minutes after the mix is started, the plates and cement shall be placed for one hour in an atmosphere having a relative humidity of 100 per cent at 37° C. (99° F.).

After one hour, the specimens shall be withdrawn from the oven and two specimens shall be placed in each tared weighing bottle and weighed (Fig. 4). The combined weight of the two specimens and the weighing bottle, less the weight of the weighing bottle and the platinum wire, shall be taken as the weight of the specimens of cement. The specimens shall immediately be submerged by pouring 50 ml. of distilled water into the weighing bottle, which shall be stored for 23 hours at 37° C. (99° F.). The specimens shall then be removed from the water. There shall be no evidence of crystal growth on the surface of the specimens. The water shall be evaporated from the weighing bottle at a temperature just below 100° C. (212° F.). The weighing bottle shall then be dried at 149° C. (300° F.) to constant weight. The weighing bottle and contents shall be weighed. The difference between the final weight of the weighing bottle and its initial weight shall be the amount of disintegration. The gain in weight divided by the weight of the specimens times 100 gives the percentage of disintegration. The average of duplicate tests (two weighing bottles containing two specimens each) shall be reported to the nearest 0.1 per cent.

Summary of detail requirements of A.D.A. specification No. 9 for dental silicate cements. First revision. (Effective July 1, 1950)

Consistency of mix	Time of setting at 37° C. (99° F.)		Compressive strength	Opacity		Solubility and disintegration	Arsenic content
	Minimum	Maximum	Minimum	Minimum	Maximum	Maximum	Maximum
	Minutes	Minutes	24 hours	$C_{0.72}$		24 hours	Percentage by weight
Disk 25 ± 1 mm. in diameter	3	8	Kg./cm.² 1,620 (lb./in.²) (23,000)	0.35	0.55	Percentage by weight 1.4	0.0002 (1 part in 500,000)

F-8 Arsenic Content.—One gram of hardened cement, obtained from a specimen 24 hours old that has been stored in a dry airtight container, shall be powdered to pass a no. 200 sieve. The powdered sample shall be digested in 100 ml. of distilled water on a steam bath for one hour. The filtrate shall be used in the test for water-soluble arsenic.

The test for arsenic shall conform to that designated by the American Chemical Society recommended specification for reagent phosphoric acid. (*Indus. & Eng. Chem.*, 19:1369 [Dec.] 1927). For detailed description of test, see Hillebrand, W. F. and Lundell, G. E. F: Applied Inorganic Analysis (New York: John Wiley & Sons, 1929), p. 217.

G. *Packaging and Marking*

G-1. Packaging.—The cement powder and liquid shall be supplied in properly stoppered leakproof glass containers. The

net weight in grams of the powder shall be indicated on the container. The net volume of the liquid in milliliters shall be indicated on the container.

G-1a. Instructions.—Instructions for proportioning the powder and liquid and for manipulation of the cement shall accompany each package. (See Section E-3g.)

G-2. Marking.

G-2a. Lot Numbers.—Each container of powder and each container of liquid shall be marked with a serial number or a combination of letters and numbers which shall refer to the manufacturer's records for that particular lot or batch of cement powder or liquid.

G-2b. Date of Manufacture.—The date of manufacture (year and month) shall be indicated on the package as a separate item or as a part of the serial number.

SIGNIFICANT FACTORS AFFECTING THE GROWTH AND DEVELOPMENT OF THE FACE

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THE HUMAN SKULL is composed of two constituents: the braincase and the face. Of all the individual skeletal parts which constitute the face, the lower jaw alone is connected with the braincase—not with the face—by a true joint. This allows the lower jaw a certain degree of independence. All the other facial bones are tightly connected with each other and, as a whole, with the braincase. Growth and development of the face depend essentially on the development of the braincase or, more precisely, on the development of the brain itself. This is evinced by facts provided by the ontogenetic and phylogenetic development of man. During the whole foetal period the growth and development of the brain surpasses that of the other parts of the body including the face so that the face appears as a small appendage to the braincase. When the growth rate of the brain slows down at the time the deciduous dentition is completed, the growth of the face exceeds that of the brain. A calculation based on Hellman's[1] measurements (1927) reveals that the length of the alveolar arch attains 60 per cent of its definitive length and 35 per cent of its width after the time the permanent teeth make their appearance. The increase of the entire face, computed from the linear measurements of its height, depth and width, amounts only to 40 per cent of its total size. Brain and braincase achieve 30 per cent of their size in this last period of growth.

Exact figures of the increase in height, depth and breadth of the growing face of anthropoid apes are not available, but it is known that, contrary to the conditions in man, the anthropoid brain and braincase, the braincase proper, but not the crests which crown it, stop growing almost completely after the eruption of the deciduous teeth. The only figures available concern the base of the skull to which the face is attached. Because of this connection the face alone continues

Essay read before the Chicago Dental Society at its midwinter meeting, February 10, 1948.

1. Hellman, Milo, Changes in the Human Face Brought About by Development. *Internat. J. Orthodontia* 13:475 (June) 1927.

to increase in length after the brain has stopped growing. According to Keith's[2] measurements the skull base of the gorilla increases 120 per cent of the length it had achieved at the eruption of the deciduous teeth. This increase is only 20 per cent in man.

I[3] have tried (1941) to calculate how much larger or smaller the cranial capacity is in great apes and man compared with the total volume of the face, represented by the product of total height, depth and width, although I have been aware that the result is only a rude estimate. I found that in gorilla and orangutan the volume of the face is three to six times greater than the volume of the braincase or the brain. Only in chimpanzees do the volumes of brain and face come closer to each other, but the volume of the face is still slightly greater than that of the braincase. In modern man, however, the brain is one and a half times, or double, the size of the face. Only in early man are they equal or the volume of the face greater as it is in chimpanzees. These facts indicate that there is a close correlation between the size of the braincase and the size of the face.

The best example of this relation has been provided by nature in what looks like an intentional experiment. In the domesticated dog, large races, such as the Irish wolfhound, the great Dane or the Saint Bernard, have relatively small and long brains and small and long braincases combined with elongated faces, while dwarf dogs such as the Pekingese or King Charles spaniel have relatively large brains with large, almost globular braincases combined with extremely short faces. "Relatively" small and "relatively" large brain means in each case "in proportion to the body size." Dwarf dogs have absolutely smaller brains than large dogs but the reduction of their brains does not keep pace with the reduction of their body size as the whole skull and the face do. Therefore, the brain becomes too large for the skull and expands the braincase to the maximum of its capacity; the sutures and even the fontanelles remain open throughout life while in large dogs they are closed after completion of the permanent dentition. Dog races intermediate in size between large ones and dwarfs are also intermediate in brain and face size. The natural experiment in dogs shows that there is a close correlation between size of brain or braincase and size of face. Small brains and braincases combine with long faces, and enlarged brains and braincases combine with short faces. The shortening of the face in dwarf dogs goes so far that the normal set of teeth has no place in the reduced jaws. In addition to the reduction in size, their number is even reduced and their pattern simplified.

The correlation revealed between brain size and face size exemplified by large and small races of living dogs has its counterpart in man, not in the different races of modern man but in the different stages of his phylogenetic evolution. Evolution shows that early phases as compared with later ones are characterized by smaller brains and braincases and larger prognathous faces. But the study of man differs from that of the dog in that the increase of the brain size effected in modern man is not bound to any diminution of the body. It represents, therefore, not a relative but an absolute increase in brain size. This fact proves that a general biological factor is involved in the ontogenetic and phylogenetic growth and development of the human braincase and face.

The reduction of the face as a phylogenetic phenomenon consists in a gradual shortening of the corpus and alveolar process of maxilla and mandible but

2. Keith, Sir Arthur, Description of a New Craniometer of Certain Age Changes in the Anthropoid Skull. *J. Anat. & Phys.* 44:267, 1910.

3. Weidenreich, Franz, The Brain and Its Role in the Phylogenetic Transformation of the Human Skull. *Trans. Am. Philos. Soc., N.S.* 31:321, 1941.

not in any broadening of the rami of the mandible as has been supposed. In addition to this decrease in length, another process of reduction takes place which has almost completely escaped attention until lately although it plays an essential role. This is the reduction in thickness and massiveness of all bones which participate in the formation of the skull. The cranial bones of all earlier stages of man surpass those of later and latest stages in thickness by 100 per cent and more. In the size of the teeth and the length and strength of the roots, the percentage is even greater. All facial bones, not only the alveolar process of the jaws, decrease in thickness and massiveness in the course of evolution. The sunken cheek bones and the receding of the front of the upper and lower alveolar process are the results of the reduction of the teeth. Another result is the prominence of those parts which have withstood the general trend to recede and marks, as it were, the line of retreat of the profile of the face. These landmarks are the nasal spine at the upper jaw, and the chin at the lower jaw. Both features make their appearance only in the latest stage of human evolution; they are not recognizable in earlier stages.[3]

The reduction of the human face during evolution is, therefore, an incontestable fact. It is correlated with the expansion of the brain and the braincase. One of the impelling factors behind this transformation of the skull was the adoption of erect position and the adjustment of the skull to consequent new static and dynamic conditions. In all quadrupeds, face and braincase are oriented in the direction of locomotion, with mouth, nose and eyes as the seats of the main sense organs, in front, and the braincase in direct contact with the spine, behind. Upright position brings the genuine quadrupedal skull on top of the body. This requires some changes in the topographical arrangement of the face and braincase. In vertebrates which are able to raise the cervical spine and the head to a higher level, the brain and braincase have shifted from a horizontal position to an oblique, semierect one by having lifted the frontal pole of the braincase. This is a characteristic difference even between lemurs which show the horizontal orientation, and apes which reveal a semierect orientation. In man this adjustment made further progress: the whole occipital half of the braincase joins the spine in adopting the erect position, but its frontal half bends downward. In other words, the base of brain and braincase deflects around the pituitary region to form a wide curve. The face attached to the frontal half of the base becomes accommodated in the "fold" of the curvature. To suit the available space it had to be shortened. This development of the human forehead which brings the brain to the top of the head results in a reduction of the face, particularly of the jaws and teeth. The discovery of human fossils during recent years permits tracing this transformation almost step by step. So far as the teeth are concerned, the entire molar row, from the cuspid teeth back, has been reduced in length and the individual teeth have been reduced in their mesiodistal diameter. Compared with the teeth of early hominids they are distinctly shorter and relatively higher and the curve of the frontal teeth is straightened.[4]

The growth and reduction of face and facial bones are measurable by the usual anthropometric methods as they have been applied by Hellman[1] and others to both skeletal material and living individuals. The facial triangle determined by the length of the nasion-porion, nasion-menton and porion-menton lines ascertains size and form of the face and eventual changes, provided a great number of specimens or individuals are available to exclude the fortuities of indi-

4. Weidenreich, Franz, The Skull of Sinanthropus Pekinensis: A Comparative Study on a Primitive Hominid Skull. *Paleontol. Sinica, N.S. D. 10, Whole Ser.* 27:1, 1943.

vidual variations. Changes in one and the same living individual can best be determined by Broadbent-Brodie's[5] roentgenographic methods. For a basis of comparison, size and form of the braincase can be determined without difficulty by the same methods.

If the question is whether the face of modern man and its constituent individual bones are still subjected to a general phylogenetic reduction, the same anthropometric methods are applicable, but in addition to the individual variations caused by differences in sex and age, those of races will play a decisive role. Some races are, certainly in morphological characteristics like that under discussion, more advanced than others. For this reason it may not be an easy task to determine by means of measurements the degree and tempo of facial reduction as a general phenomenon in modern man. It will be still more difficult to determine whether an ascertained facial reduction of a given individual is the result of purely individual factors or should be attributed to a general trend.—*American Museum of Natural History.*

5. Brodie, Allan G., On the Growth Pattern of the Human Head. From the Third Month to the Eighth Year of Life. *Am. J. Anat.* 68:209 (March) 1941.

REVERSIBLE AND IRREVERSIBLE HYDROCOLLOID IMPRESSION MATERIALS

E. W. Skinner,* Ph.D.; E. N. Cooper,† B.S., and Frank E. Beck,‡ D.D.S., M.S.D., Chicago

THE use of hydrocolloid impression materials in dentistry has become firmly established. There can be no doubt of their usefulness and accuracy in the obtaining of impressions for prosthetic appliances, particularly in cases where missing teeth are to be replaced by bridgework or partial dentures. The chief advantage of this type of material is its ability to reproduce with remarkable accuracy undercuts and dovetails in an impression. It can be stated conclusively that there is no other impression material which can be used with greater accuracy, provided that the manipulation and technic are properly carried out. As with most dental materials, a proper technic requires a certain fundamental knowledge on the part of the user. It is with the hope that better use can be made of these materials that the following review of fundamental knowledge and the presentation of some practical ideas are offered.

Types of Hydrocolloid Materials

A hydrocolloid is, by definition, a colloid with water as the dispersion medium.

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Author's Note. A number of commercial impression materials have been discussed in this paper by code letter, without identification. Inasmuch as the subject of the research was the behavior of the materials collectively and not individually, only one batch of each material was tested. Therefore, in fairness to the authors and to the manufacturers, the identification of these materials is not published.

The colloid may be a gel, with a structure which allows the water to be held in the gel by capillary action. If the gel can be changed to a colloidal sol or a solution by some physical means, such as heating, and if the gel is again formed upon cooling, the hydrocolloid or gel is said to be reversible. On the other hand, if the colloidal sol is changed to a gel by a chemical reaction, for example, and if the gel cannot be returned to the sol condition by simple means, the hydrocolloid is said to be irreversible.

Ordinary gelatin is an example of a reversible hydrocolloid. A gelatin dessert, for example, as purchased at the store, is a coarse, sand-like powder, but when this powder is dissolved in an appropriate amount of boiling water, it forms a sol which gels upon cooling. The gel may be returned to the sol by heating, and formed again on cooling, and so forth. Gelatin is not generally used, however, in hydrocolloid impression materials, because its gelation temperature is lower than mouth temperature, and it would be impossible to chill the impression in the mouth to a sufficiently low temperature to bring about gelation. Agar-agar is the hydrocolloid generally employed in the reversible type of hydrocolloid impression material. This hydrocolloid, obtained from a certain species of seaweed, exhibits a gelation temperature at, or slightly above, mouth temperature.

The irreversible hydrocolloid employed in impression materials is some form of a soluble alginate. An alginate is a salt of alginic acid, which is extracted from marine kelp. Either potassium or sodium alginate can be used; potassium alginate is probably used in these materials more than sodium alginate by American manufacturers, although no definite data are available in this regard.

Process of Gelation

The ultimate result with both types of hydrocolloid impression materials is the formation of a gel in the patient's mouth, so that when the impression is removed all undercuts and dovetails will be accurately reproduced. The essential differences in these types of materials are the methods by which the gel is formed in the patient's mouth.

In the case of the reversible hydrocolloid material, the hydrocolloid is placed in boiling water, either in the tube as received, or else in a mixing syringe, and it is changed to the sol or liquid condition. While in this condition, the material is placed in the tray, carried into the mouth and impressed against the parts to be reproduced, and the sol is changed to the gel by the circulation of cold water through the tray before the impression is removed.

In the case of the alginate materials, the soluble alginate is dissolved in water by mixing it in a plaster bowl with a spatula. The chemical reaction involved is one in which the soluble alginate is changed to an insoluble gel. Inasmuch as this gel must be formed in the mouth of the patient, a retarder is added which will prevent the change of the soluble alginate to the insoluble form until the material has been placed in the mouth of the patient.

It should be emphasized that once the gel has been formed, the essential properties of the two materials are very similar.

Preparation of the Reversible Hydrocolloid Impression

In every case, the manufacturer's directions should be consulted for the proper manipulation of these materials. In general, the procedure for the preparation of an impression to be obtained with a reversible hydrocolloid is somewhat as follows.

As previously stated, the hydrocolloid must first be changed to the liquid condition by boiling it in water. The use of the mixing syringe is to be recommended

somewhat over the method of boiling the material in the original tube. It is essential that the material be mixed thoroughly while it is in the liquid condition, in order that a homogeneous temperature and texture can be obtained. The use of a mixing syringe is more likely to insure such homogeneity. This method also offers the advantage that the material can be ready after 3 to 5 minutes of boiling. If the material is boiled in the original container, 8 to 10 minutes of boiling generally are required.

Whatever the method employed for changing the gel to the liquid condition, the material must be cooled before it is placed in the patient's mouth. It is, therefore, removed from the bath and placed in water at a temperature of approximately 130 to 145° F. (58 to 63° C.). It should be mixed occasionally at this stage, either with the plunger in the mixing syringe, or else by rolling the tube of material between the palms of the hands.

There are at least two reasons for precooling the material before it is placed in the patient's mouth. (1) Obviously, the material must be cooled to a temperature which can be tolerated by the patient. (2) It has been pointed out[1] that the thermal contraction of the material during subsequent cooling in the tray will be less if the material is placed in the mouth at the lowest possible temperature. This minimum temperature is, of course, fixed by the gelation temperature of the material itself. The impression tray must be loaded and placed in the mouth before the gel forms. It is an important characteristic of these materials that the gel is changed to the sol at a temperature much higher than that at which it is changed from the sol to the gel. Probably the lowest temperature to which these materials can be cooled at the time they are placed in the mouth is approximately 110° F. (43° C.).

After the material is exuded onto the impression tray, it should be smoothed and pressed into the tray with a wet finger, in order to insure that all of the retentions are engaged by the material. The impression is then obtained.

Preparation of the Irreversible Hydrocolloid Impression

In the manipulation of any type of hydrocolloid impression material, one of the chief requirements is that a proper technic be employed throughout so that the maximum strength of the gel will be obtained before the impression is removed from the mouth. One of the factors which controls the strength of a gel is its water content; other factors being equal, the greater the water content of the gel, the weaker the gel will be, and the converse. The alginate impression materials are no exception to this rule; consequently, the proper water-powder ratio must be used. This ratio is specified by the manufacturers of the materials.

A second important factor in respect to the strength of the gel is the control of the gelation time of the impression material. As pointed out in a previous paper,[2] the gelation time is affected markedly, within practical limits, by the temperature of the mixture of alginate and water. In fact, this is the only practical method that the practicing dentist has to control the setting time of these materials. Consequently, mixing water of the proper temperature must be used. This temperature is specified by the manufacturer, but it is generally between 65° F. (18° C.) and 75° F. (24° C.). Mixing temperatures above or below this range will cause the material to gel sooner or later, respectively, than the time indicated by the manufacturer.

The time of spatulation does not affect

1. Paffenbarger, G. C., Hydrocolloidal Impression Materials: Physical Properties and a Specification. *J.A.D.A.* 27:384 (March) 1940.

2. Skinner, E. W., and Pomés, C. E., Alginate Impression Materials: Technic for Manipulation and Criteria for Selection. *J.A.D.A.* 35:245 (Aug.) 1947.

the gelation time within practical limits, but it does affect the strength.[2] Underspatulation, particularly, will result in a weak material, since the ingredients of the powder will not have been thoroughly dissolved in the water. The proper spatulation time generally is one and one-half to two minutes, but the time specified by the manufacturer should be strictly followed. A timepiece is an essential part of the equipment to be used during the manipulation of an alginate impression material.

As previously stated, the essential reaction which occurs in the gelation of an alginate impression material is the changing of the soluble alginate to an insoluble form. The insoluble alginate so formed is generally calcium alginate, and the soluble alginate (potassium or sodium alginate) is changed to the insoluble form (calcium alginate) by a reaction with calcium sulfate in solution. Consequently, it is imperative that the plaster bowl, spatula, and any other utensils used be entirely free of contaminating chemicals, such as plaster of paris, dental stone, investment, and so forth.

After the mixture has been spatulated, it should attain a smooth, creamy consistency. It is then inserted into the impression tray in the same manner as that described for the reversible hydrocolloid, and the impression is obtained.

A perforated tray, very similar to that employed with the reversible hydrocolloid impression material, is used, but no water cooling device is necessary. The use of a perforated tray with alginate impression materials has been criticized[3] on the basis that the usual perforated tray does not confine, or trap, the alginate material sufficiently so that it can be forced into intimate contact with the teeth and tissues. In general, other types of retentive devices and methods have not been as successful as the perforated tray, in our hands, in holding the impression material tightly against the tray when the impression is removed from undercut models. If the hydrocolloid impression, regardless of its type, is displaced from the walls of the tray during the removal of the impression, a definite warpage of the impression usually will result.

Obtaining the Impression

The loaded tray is inserted into the mouth in the usual manner, and it is held rigidly in position until the gelation is complete. The time of gelation of the reversible hydrocolloid material will, of course, depend upon the temperature of the water employed for the chilling of the impression and the rate at which it is circulated through the tray. It must be remembered that the hydrocolloid material is a poor thermal conductor and sufficient time must be allotted for the thorough chilling of the material before the impression is removed from the mouth.

The gelation time of the alginate impression can be determined by touching the residue in the plaster bowl. It has been shown[2] that the maximum strength of the alginate material is not reached until two to three minutes after gelation has occurred. The impression should, therefore, be left in the mouth for at least two minutes after gelation has taken place.

Regardless of the type of hydrocolloid, the impression must be removed from the teeth and tissues suddenly. It is characteristic of a gel that it can resist a sudden deformation without fracture much better than it can a slowly applied or static force.

Dimensional Stability of the Hydrocolloid Impression

After an impression has been removed from the mouth, it is often sent to the dental laboratory for the construction of the model. Such a practice has been

3. Jordan, L. G., Alginate Impression Materials, *J.A.D.A.* 32:985 (Aug.) 1945.

criticized in the case of a hydrocolloid impression, because of the lack of dimensional stability of the hydrocolloid in air.

In a paper published by Kern in 1938,[4] it was shown that the reversible hydrocolloid impression materials were not stable in any environment to which they might be subjected in dental practice. At that time, six commercial products were tested by means of comparator microscopes and a brass trough, in a manner similar to that employed for the measurement of the setting expansion of gypsum products.[5] It was found that four of the materials shrank about 1 per cent when they were allowed to remain in air with a relative humidity of 32 to 47 per cent for one hour. Two of the materials shrank only 0.1 per cent under similar conditions of test.

It is, of course, a natural phenomenon for a gel to shrink by syneresis or evaporation of water when it is exposed to air. However, it might be expected that if the relative humidity of the air were kept at 100 per cent, a satisfactory dimensional stability would result. When the above experiment was repeated in saturated air, a contraction of the material again occurred, but the magnitude of contraction was much less than that found in the previous experiment. For example, the greatest contraction in 100 per cent relative humidity, observed at the end of 3 hours, was 0.28 per cent, in contrast to the contraction of 1 per cent observed in the previous experiment. Furthermore, the rate of contraction of the material when it was stored at 100 per cent relative humidity for 3 hours was very small.

When the hydrocolloid materials were immersed in water, after they had contracted in air, only three of the materials regained approximately their original dimensions; the other three imbibed so much water that they swelled as much as 0.7 per cent beyond their original size.

Kern's experiments have been repeated recently,[6] in order to determine whether or not the modern reversible hydrocolloid materials have been improved in regard to dimensional stability in comparison with similar materials on the market ten years ago.

The results of the experiments carried out on the dimensional stability of the materials in air, and during subsequent immersion in water, are shown graphically in Figure 1. Six commercial materials, purchased on the open market, were

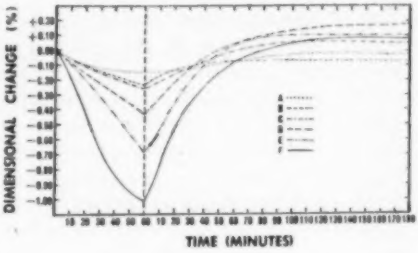

Fig. 1.—Linear contraction in air (31-42 per cent relative humidity) and subsequent expansion in water of six reversible hydrocolloid impression materials

tested; three of the materials were of the same commercial brand as used by Kern. As can be noted in Figure 1, the modern materials are somewhat more stable dimensionally in air than were the materials studied by Kern, although material F contracted in 60 minutes as much as did some of the prewar materials. All of the modern materials exhibited a better dimensional stability than the prewar materials when they were immersed in water for three hours subsequent to their exposure in air. According to Figure 1, the linear dimensions varied only from

4. Skinner, E. W., and Kern, W. R., Colloidal Impression Materials. *J.A.D.A.* 25:578 (April) 1938.

5. Taylor, N. O.; Paffenbarger, G. C., and Sweeney, W. T., Dental Inlay Casting Investments: Physical Properties and a Specification. *J.A.D.A.* 17:2266 (Dec.) 1930.

6. Beck, F. E., A Study of the Dimensional Stability of Agar-Base Hydrocolloidal Impression Materials. Thesis, Northwestern University Dental School, 1947.

0.08 per cent less than the original dimension at the end of three hours (material B) to 0.18 per cent above the original dimension (material D).

A slight contraction after the initial expansion was observed while materials B, E, and F were immersed in water. Materials B and F started to contract at the end of the first hour. James[7] has demonstrated that some of these materials shrink markedly after a definite time of

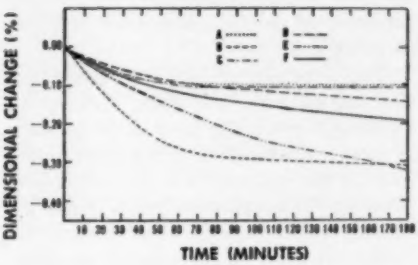

Fig. 2.—Linear contraction of six reversible hydrocolloid impression materials when they are exposed to air with a relative humidity of 100 per cent

immersion in water, and the contractions observed in the present investigation possibly are due to the same cause.

When the modern reversible hydrocolloid materials are subjected to air in a relative humidity of 100 per cent, the results are no different than those found by Kern.[4] The data for the modern materials are presented in graphic form in Figure 2, and it is clear that immersion in water (Fig. 1) is possibly more effective in the preservation of the dimensional stability than is an exposure to air at 100 per cent relative humidity.

It can be assumed, however, that if the impression must be preserved in air, it is better preserved in an atmosphere of 100 per cent relative humidity than in the atmosphere which generally prevails in a dental office or laboratory. The condition of 100 per cent relative humidity is attained when the impression is wrapped in a wet cloth and placed in a closed container for storage, as advocated by many manufacturers.

According to the recent results, impressions made with the materials investigated are best preserved by storage in a relative humidity of 100 per cent. The stored impressions should then be immersed in water two to three hours before the model is constructed.

Similar experiments on the dimensional stability of the irreversible (alginate) hydrocolloid impression materials have been reported.[8] The dimensional stability of eight commercial alginate impression materials was studied. Seven of the eight materials exhibited a dimensional stability superior to that of any of the agar impression materials studied (Fig. 1) when the materials were exposed to air with a relative humidity of 35 to 45 per cent. When the alginate materials were immersed in water for three hours, they were less stable dimensionally than were the agar materials (Fig. 1). The stability of the alginate materials was considerably improved, however, while they were immersed in the proper fixing solution.[8]

When the alginate materials were exposed to air in a relative humidity of 100 per cent, five of the eight materials exhibited remarkably stable dimensions for three hours and longer. The irreversible hydrocolloid impression materials are, therefore, likely to be more stable dimensionally than the agar materials (Fig. 2) when they are stored in air at a relative humidity of 100 per cent. In general, therefore, impressions made with some of the alginate materials can be sent to the dental laboratory wrapped in a wet cloth, in a closed container, without as

7. James, A. G., Maintenance of Equilibrium in Reversible Hydrocolloid Impressions. *J. D. Res.* 28:108 (April) 1949.

8. Skinner, E. W., and Pomés, C. E., Dimensional Stability of Alginate Impression Materials. *J.A.D.A* 33:1953 (Oct.) 1946.

Fig. 3.—Model employed for the determination of the accuracy of impressions with hydrocolloid materials

much danger of dimensional change as in the case of the agar materials. Such a rule cannot be followed, however, with all alginate impression materials. Obviously, the safest method to be employed with any type of hydrocolloid impression is to construct the model immediately after the impression is obtained.

Accuracy of the Hydrocolloid Impression

The previous results were obtained on specimens of material which were relatively free to expand or contract. Obviously, a similar freedom of movement does not exist in clinical practice, since the hydrocolloid materials are held rigidly against the walls of the impression tray by the retentions or perforations in the tray. In order to study the general accuracy and dimensional stability of the impression, impressions of the model shown in Figure 3 were studied.

This model has been described in detail in a previous publication.[2] In summary, the posts, designated in pairs hereafter as I, II, and III (numbered 1, 2, and 3 respectively in Fig. 3), are paired identically with the post directly opposite for degree of undercut. Posts I possess the greatest degree of undercut—the greatest undercut on the outside of the post is 16 per cent, whereas that on the inside is 22 per cent. There are no undercuts on the inside surfaces of the other posts; the undercuts on the outside are 16 per cent for posts II, and 20 per cent for posts III. The impression tray used to obtain the impressions of this model was a perforated cylindrical cage, which fitted the model in a manner analogous to that of an impression tray in the mouth.

Impressions of the model were obtained using five reversible hydrocolloid impression materials and four irreversible materials, purchased on the open market. The directions supplied by the manufacturers of the materials were followed in every case.

The accuracy of the impression was determined from the stone model; the distance between the faces of the opposite posts was measured on the original model, and on the stone model. The differences between these measurements were expressed in percentage of the distance between the posts on the original or master model. These results were then corrected for the setting expansion of the stone, which was 0.16 per cent; the water-powder ratio and spatulation time were held constant throughout the experiments. The stone models were constructed immediately after the impression was removed from the metal model, and also 30 minutes and 60 minutes, respectively, after the impression was removed from the model, the impressions having been stored in air (relative humidity 50 to 60 per cent) during the 30 to 60 minute periods. The measurements obtained before the impression was exposed to air are presumably a measure of the accuracy of the impression under ideally controlled conditions. Measurements obtained after the impression has been exposed to the atmosphere of the laboratory for periods of 30 and 60 minutes, respectively, supposedly are related to the dimensional stability of the impression in the relative humidity specified (50 to 60 per cent).

The results of these tests are presented in Tables 1 and 2. The code letters used

for the different materials, as given at the head of columns 2, 3 and 4, are designated according to the individual materials and the type of material; the type of material is designated as "R" or "I" indicating "reversible" or "irreversible" respectively.

The accuracy of the impression at the time of removal is indicated by all of the data obtained for 0 minutes. The first figure of each datum indicates the average discrepancy found in the stone models for the distance between each pair of posts; a minus value indicates that the distance was undersize, and a plus value indicates an oversize distance. The figure following the plus and minus sign (±) indicates the average deviation between the average and the values obtained in the two or more trials made for each determination. This latter figure is of importance in an estimation of the accuracy of the material during different trials.

As might be expected, the posts (I and III) with the largest undercuts generally exhibited the greatest discrepancies. In most instances, an error of 0.1 per cent for the accuracy of reproduction of the model by the impression is a generous allowance. When the impression was not exposed to air, all of the distances between the pairs of posts were reproduced within 0.1 per cent in the case of the reversible hydrocolloid materials (Table 1).

Large discrepancies between various posts might indicate a warpage. All of the alginate materials, except GI (Table 2), exhibited more than 0.1 per cent difference in the errors obtained for the distances between various pairs of posts as measured on the stone model. Materials HI and JI were reported as satisfactory in this respect in a previous report,[2] and consequently it is possible that poor batches of material were used for obtaining the data in Table 2. In general, the accuracy of the materials appears to be satisfactory, with the possible exceptions of materials DR (Table 1), HI and JI (Table 2), which appear to exhibit higher discrepancies in reproduction than the others. However, since only one batch of material was used in each case, no definite conclusions can be drawn to the detriment or credit of the individual materials. Furthermore, it is evident that

Table 1.—Dimensional stability of reversible hydrocolloid impressions in air (relative humidity 50-60%)

Time exposed (minutes)	Accuracy of reproduction (per cent)				
	AR	BR	CR	DR	ER
Post I					
0	−0.03±0.01	+0.06±0.03	+0.19±0.07	−0.22±0.02	+0.15±0.01
30	+0.01±0.03	−0.02±0.06	+0.01±0.09	+0.12±0.14	+0.03±0.05
60	+0.14±0.02	+0.10±0.00	+0.21±0.01	−0.08±0.16	+0.08±0.00
Post II					
0	−0.01±0.01	+0.01±0.03	+0.11±0.03	−0.12±0.02	+0.05±0.05
30	−0.03±0.01	−0.05±0.11	−0.03±0.07	+0.02±0.02	+0.06±0.00
60	+0.10±0.14	+0.02±0.00	−0.26±0.12	+0.32±0.10	+0.11±0.05
Post III					
0	+0.06±0.02	+0.03±0.01	+0.13±0.07	−0.23±0.01	+0.09±0.05
30	−0.01±0.01	+0.10±0.00	−0.01±0.05	+0.06±0.02	+0.04±0.00
60	+0.03±0.05	+0.06±0.02	+0.33±0.21	+0.07±0.07	+0.08±0.04

Table 2.—Dimensional stability of irreversible hydrocolloid impressions in air (relative humidity 50-60%)

Time exposed (minutes)	Accuracy of reproduction (per cent)			
	FI	GI	HI	JI
Post I				
0	−0.10±0.02	+0.03±0.05	−0.29±0.01	+0.02±0.02
30	+0.27±0.27	+0.03±0.05	−0.16±0.00	+0.38±0.08
60	−0.04±0.08	−0.12±0.10	−0.22±0.10	+0.42±0.14
Post II				
0	−0.05±0.01	+0.02±0.02	+0.04±0.14	+0.22±0.08
30	+0.01±0.17	−0.07±0.11	−0.15±0.05	+0.40±0.12
60	+0.02±0.08	−0.01±0.05	−0.18±0.14	+0.70±0.26
Post III				
0	+0.03±0.03	+0.06±0.00	+0.11±0.03	+0.15±0.05
30	+0.09±0.09	+0.04±0.02	−0.11±0.05	+0.42±0.04
60	+0.06±0.04	−0.12±0.14	−0.08±0.08	+0.55±0.03

there is no difference in the accuracy of impressions made with either alginate or agar hydrocolloid materials, provided that the material and technic are satisfactory in each case.

The dimensional stability of the impression, as indicated by the change in the data when the model was poured at 30 minutes and 60 minutes, respectively, after the impression was removed, is generally the same as those indicated in Figure 1, except that the changes are much less marked.

Since the impressions were stored in air at a relative humidity of approximately 50 to 60 per cent, a contraction of the material should be expected. Inasmuch as the material is fastened to the walls of the cylindrical tray, such a contraction of the material should be manifested in the impression or model space as an expansion. Otherwise, a warpage may be suspected.

If 0.1 per cent is accepted as the maximum change allowable without an inaccuracy of practical significance resulting, many of the impressions can be said to exhibit satisfactory dimensional stability in air for at least 30 minutes.

For example, the impression obtained with material AR exhibited only minor changes in dimension, not of practical interest, when it was allowed to stand 30 minutes before the model was poured. However, after the impressions were allowed to stand for 60 minutes, the discrepancies became larger, particularly in the cases of posts I and II. In general, the same observation holds for materials CR, DR (Table 1), GI, HI, and possibly FI (Table 2). The remaining materials apparently could not be preserved in air for as long as 30 minutes without marked discrepancies appearing in the impression.

It must be kept in mind, however, in interpreting the data presented in Tables 1 and 2, that the dimensional stability of the impression is greatly affected by the relative humidity of its environment, and the consequent rate of evaporation of water. The data in Tables 1 and 2 were obtained during the summer months when the relative humidity was relatively high. Under conditions of lower relative humidity, it is conceivable that none of the impressions might have been stable during a 30-minute exposure to air.

The data in Tables 1 and 2 demonstrate, however, that the dimensional changes which occur in the impression are not as great as those indicated in Figure 1, when the impression was not confined by retentions of some nature. Furthermore, it is evident that the dimensional stability of a reversible hydrocolloid impression can be equally as good as that of an irreversible hydrocolloid impression. The general conclusions to be reached from all of the data presented is that the safest procedure for the dentist to employ is to pour the stone model immediately after the impression is obtained. It appears that regardless of the environment or the type of hydrocolloid impression material used, its dimensional stability is uncertain.

Preparation of the Model

Some of the alginate impression materials must be immersed in a fixing solution; some of the agar impression materials also benefit from such a treatment. The purpose of such a treatment is to insure a hard surface on the stone model. A number of solutions can be used for this purpose,[8] but a 2 per cent solution of potassium sulfate is entirely satisfactory. The period of immersion should not be less than 10 minutes nor longer than 30 minutes, in order that any danger of a disintegration of the impression material may be avoided.

Usually, a mixture of dental stone is poured into the impression, although a method for electroplating the surface of reversible hydrocolloid impressions has been devised.[9] When a model is constructed with dental stone, great care must be taken in pouring the freshly mixed stone so that the impression will not be distorted. If the impression is boxed in with wax or other material, special care must be taken in this regard. Under no circumstances should the freshly mixed stone be poured into the impression, and then pressed against an additional mixture, in order to form the base of the model. Such a procedure is bound to distort the impression. If the stone mixture is poured into the impression and allowed to set before the base of the model is added, such a warpage can be avoided. The danger of the latter method is that the model may warp during setting because of insufficient thickness. Paffenbarger[1] states that the base of the model should be at least 10 mm. in thickness in order to prevent warpage.

The stone model should not be separated from the impression for at least 30 minutes after the stone has set, in order to provide sufficient time for the stone adjacent to the hydrocolloid to harden thoroughly. The stone model should not be allowed to remain in contact with the hydrocolloid for too long a time, however, or a rough surface may occur on the model. Under the proper conditions, a strong, hard model should result, with superior dimensional accuracy.

Summary and Conclusions

The properties and technics for the manipulation of hydrocolloid impression materials were described and discussed. Hydrocolloid impression materials may be classified as (1) reversible or agar hydrocolloids and (2) irreversible or alginate hydrocolloids. In consideration of the research data presented in this paper and in the other papers discussed, it is evident that:

1. All hydrocolloid impression materials contracted in air when the relative humidity was less than 100 per cent.
2. Some of the alginate impression materials exhibited excellent dimensional stability in water-saturated air (relative humidity 100 per cent). The reversible

9. Dwight, O. D., Copper Plating of Reversible Hydrocolloid Impressions. Paper read at the Chicago meeting of the Committee to Investigate Elastic Impression Materials, Sept. 10, 1948.

hydrocolloid materials generally contracted under these conditions.

3. When the hydrocolloid impression materials were immersed in water after exposure to the atmosphere, the reversible type of materials more nearly returned to their original dimensions than did the irreversible materials.

4. The modern reversible hydrocolloid impression materials were found to be superior to those manufactured 10 years ago, so far as their dimensional stability was concerned, especially during immersion in water.

5. Hydrocolloid impressions of a specially designed metal model were equally accurate whether a reversible or an irreversible hydrocolloid material was used. Not all of the materials exhibited equal accuracy of reproduction, however.

6. Some of the hydrocolloid impressions were found to be stable when exposed to the air (relative humidity 50 to 60 per cent) for as long as 30 minutes. Some of the alginate materials were as stable as some of the agar materials in this respect. However, it was pointed out that the stability of the impression is dependent on the relative humidity. If the relative humidity had been less than 50 to 60 per cent, the impressions would probably not have been stable for 30 minutes.

7. In the light of all the data considered, it was concluded that the best method for insuring the accuracy of the model is to pour the model immediately after the impression has been obtained. If the impression must be stored, however, the best method appears to be to wrap it in a wet cloth, and to place it in a closed container. In the case of the reversible hydrocolloid material only, the impression should be immersed in water for not longer than three hours after a period of storage and just prior to the pouring of the model.

A Rational Technic.—The basic general technic for the manipulation of a hydrocolloid impression material, based on the data obtained in the researches reviewed, is as follows:

Reversible Hydrocolloid.—1. The material must be placed in boiling water, preferably in a mixing syringe, until it has been thoroughly liquefied.

2. It is then cooled to 130 to 145° F. (58 to 63° C.) and mixed in the syringe or tube, in order to insure homogeneity of mass and temperature.

3. The material is then placed in an impression tray provided with retentions of some nature, and with a method for the circulation of water. Special care must be taken to insure that the material engages the retentions completely.

Irreversible Hydrocolloid.—1. The powder and the water must be proportioned according to the directions of the manufacturer.

2. The temperature of the mixture of water and alginate powder must be controlled accurately according to the directions of the manufacturer. Usually a temperature between 65° F. (18° C.) and 75° F. (24° C.) is satisfactory.

3. The time of spatulation must be observed with a timepiece. The proper spatulation time is one and one-half to two minutes, or the time specified by the manufacturer of the material.

4. The spatulated material is inserted into the impression tray so as to engage the retentions in the tray completely.

Obtaining the Impression.—1. The tray containing the hydrocolloid material is carried into the mouth and impressed against the tissues in the usual manner.

2. The tray is held rigidly in position until the gelation has occurred. The time for the gelation of the reversible material will depend upon the temperature and rate of the circulation of the water. The temperature of the water used in mixing the alginate material will largely determine its gelation time.

3. When the material is no longer sticky when it is touched with the finger, gelation has occurred. In the case of the alginate material, two minutes should elapse before the impression is removed. The impression should be removed from the tissues suddenly.

Subsequent Treatment.—1. The impression should be washed thoroughly in tap water. If so directed by the manufacturer, the alginate impression should be immersed in a fixing bath for not less than 10 minutes, and for not longer than 30 minutes.

2. The stone model should be poured immediately after the impression has been processed. Special care should be taken not to distort the impression during this procedure.

3. The impression should be separated from the model in not less than 30 minutes or more than one hour after the stone has hardened.—*311 E. Chicago Avenue.*

▲

Working Efficiency of Man.—The human body is essentially a combustion machine that functions only as its cells release energy by burning the foodstuffs taken in. True, this combustion in the cells is a very complicated affair, carried on at low temperatures and in numerous independent steps through the aid of special catalysts. Although it is far less violent than the gasoline explosions in an automobile motor, its over-all efficiency is no greater, and it is even more dependent upon rapid dissipation of its waste heat. The working efficiency of men, horses, and dogs ranges between 20 and 25 per cent, but the Diesel engine designed by present-day engineers performs at over 40 per cent efficiency.

For every unit of combustion energy transformed into work-output by our bodies, three or four similar units must be dissipated as waste heat. Failure of such dissipation to keep pace with heat production in the body may mean heat stroke and death within a few hours. The waste heat of combustion thus becomes one of the body's most important excretory products.—*Clarence A. Mills, "Temperature Dominance over Human Life," Science 110:267, September 16, 1949.*

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EDITORIALS

NATIONAL CHILDREN'S DENTAL HEALTH DAY TO BE OBSERVED FEBRUARY 6

PREPARATIONS for the observance of the second annual National Children's Dental Health Day, February 6, are now complete. Reports received by the Council on Dental Health indicate that at least twice as many communities are participating in this year's program as participated in the initial program last year. It is too much to expect that this rate of increase each year will continue indefinitely, but it is not too much to expect that each year more and more communities will participate in Children's Dental Health Day activities until eventually every community will be represented in the national program. The interest displayed by so many communities in dentistry for children indicates that at last one important aspect of the four-point program long advocated by the Association is becoming a reality.

In 1940, when dentistry celebrated its one-hundredth anniversary as a profession, it was predicted that the profession would devote as much attention to preventive measures during its second century as it formerly had devoted to improving operative and restorative technics. In the short span of ten years, notable progress has been made toward the fulfilment of that prediction. Researchers have demonstrated the merits of topically applied sodium fluoride. They are conducting long term studies on the fluoridization of drinking water and they are studying other measures, such as ammoniated dentifrices, which bear promise of inhibiting the incidence of caries.

In 1948 Congress passed the Association's dental research bill which enabled the United States Public Health Service to initiate plans for a National Institute of Dental Research, and last year the Association launched Children's Dental Health Day on a nationwide basis. All of these developments are effective weapons in the profession's fight against dental disease. National Children's Dental Health Day can

be made one of the most potent weapons as it will focus public attention on dental health, stimulate more interest in dental research and motivate communities to establish a continuous year-round dental health program for the youth of the nation.

SECOND APPEAL FOR RELIEF FUND CONTRIBUTIONS

GIVE NOW—GIVE GENEROUSLY—THE NEED IS URGENT

THIS is an appeal! This is an appeal for help! It is an appeal to every member of the Association on behalf of several score of dentists who are urgently in need of assistance. Last November members received a small packet of relief fund seals and an invitation to contribute to the Relief Fund. Many responded generously—far too many did not. Those who have not contributed are urged to do so now.

Every member of the profession, willingly and without thought of recompense, furnishes assistance to needy patients suffering from pain and infection. The Council on Relief urges all members to give the same consideration to worthy fellow practitioners who are suffering from the lack of the bare necessities of life. Under present conditions every active member can spare a few dollars, without hardship, which will relieve the hardships of others less fortunate.

For some unaccountable reason relief contributions this year have fallen far below the anticipated goal, placing relief recipients in a precarious position. It has become necessary therefore for the Council on Relief to mail a new appeal to all members urging increased support for the fund. If you have neglected to send in your contribution please do so at once. If you have contributed, perhaps you can spare a little more for this humanitarian effort. Use the envelope furnished by the Council or address your contribution to the American Dental Association Relief Fund, 222 East Superior Street, Chicago 11, Illinois.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

INITIATES STUDIES ON DENTAL SOCIO-ECONOMICS:

MEMBERS ARE URGED TO COOPERATE

ONE of dentistry's greatest needs is more and better information on its social and economic status. Although members of the profession are kept well informed of new developments in all phases of operative procedures they are less well informed on dental socio-economics.

There are many reasons why dentistry must know itself, many reasons why the same scientific study must be devoted to its socio-economic aspects as has been given to the development of its operative and surgical procedures. Only two of these reasons are mentioned here: the threat of compulsory health insurance, and the growing interest in community dental health programs.

Dentists of Britain were unable to avoid nationalization of their services because the profession did not have reliable statistics with which to refute the claims made by the promoters of the National Health Service Act. Events in Britain during the past year and one-half have demonstrated the fallacy of relying on studies made by so-called "social experts" who lack even rudimentary knowledge of the problems of the profession. The errors of the British planning are written in large letters on the pages of an open book for all who wish to read. American dentistry can profit from those errors by making its own studies and obtaining its own facts. Certainly in the face of England's experience the dental profession in America cannot afford to leave all fact finding to government agencies.

The growing interest in the establishment of community dental health programs also makes it imperative that dentistry be fully informed regarding the many factors that influence the distribution of its services. Of special value are data on distribution of dentists, dental hygienists and dental technicians, mortality and retirement rates and age distribution of dentists, and data on specialists. Information is needed about dental needs, demands and costs, dental facilities, plans and programs and many other aspects of dental practice. The development of community dental health programs is in itself a necessity in the profession's fight against compulsory health insurance.

The Bureau of Economic Research and Statistics, established under the revised Constitution and Bylaws of the Association, now has under way a series of studies which will provide the profession with accurate basic information on many of the more important factors which influence the practice of dentistry and the distribution of dental services to the public. It will be necessary in many instances for the Bureau to gather this information directly from members of the profession. The gathering of such data is no simple or easy task. It requires the services of highly trained technical personnel and the full cooperation of members of the Association, as ordinarily the data must be obtained through the use of questionnaires. Members who receive these questionnaires are urged to fill them out and return them promptly.

Dentistry must know its strengths, its weaknesses and its potentials. Dentistry must obtain this information for itself rather than depend upon government agencies to obtain it as was done in Britain. Data collected by the Bureau of Economic Research and Statistics will enable the profession to extend its services logically and at the same time protect society from the dangers resulting from the nationalization of health services.

BRITISH DENTISTS REPORT DIFFICULTIES OF PRACTICE UNDER NATIONAL HEALTH SERVICE SYSTEM

Two reports recently received throw considerable light on the impact which the nationalization of health services has had on the practice of dentistry in Britain. The "Penman Report," discussed elsewhere in this issue of THE JOURNAL,[1] is a time study of dental operations performed by British dentists. The other report,[2] issued by *The Practitioner,* a nonpolitical publication in London, consists of an un-

biased review of the first year's operation of the British National Health Service system.

According to *The Practitioner*, the British General Dental Service has provided millions of adults, particularly those in the poorer areas, with service which they otherwise might not have received. Furthermore, it has increased the practice and the income of many dentists, particularly those located in the poorer neighborhoods. However, these two assets are counterbalanced by many liabilities which already have lowered the standards of dental practice and threaten to lower still further standards of dental health.

Dentists who accept all patients who present themselves for treatment work harder, longer hours and under greater nervous strain than formerly. Although their income has improved, their health has suffered. Harried and hurried they are unable to render the quality of service which they formerly gave their regular patients. Under these circumstances, patients become disgruntled, dentists become distracted and the good will of their practice deteriorates. Dentists who restrict the number of new patients in order to provide their old patients with high quality service have found their income seriously reduced.

Dentists whose practices consist largely of extraction of teeth and the construction of dentures experience little difficulty in obtaining authorization of estimates for such services from the Dental Estimates Board. Eight dentists on the Board authorize such estimates at the rate of 16,000 a day—a mere 2,000 per estimator.

Dentists that insist on providing patients with conservative restorative dentistry experience more difficulty in obtaining authorization. Estimates for crowns, bridges, inlays and periodontic treatment, in most instances, must be approved by a member of the Dental Estimates Board and frequently by a Ministry dental officer. This regulation delays treatment, places a premium on conservative dentistry, irritates the patient and reduces the dentist to the status of an automaton in the hands of a government agency. Conscientious dentists object strenuously to the Board's policy of granting almost blanket approval for blood and vulcanite dentistry while granting only limited approval for conservative service. The profession is beginning to realize that approval or disapproval of estimates is influenced by costs rather than patients' welfare. Under these conditions many dentists are "finding it a great temptation to give up the endless struggle for the right to give their patients the treatment that they think best and to take the line of least resistance by estimating for treatment (the type of service) which they know will be approved immediately."[3]

These are but a few of the many criticisms leveled by British observers at their present health system. They forecast both a national headache and a national toothache for the British Isles unless immediate steps are taken to shake loose many of the nuts and bolts that now interfere with the workings of the hastily conceived and poorly designed national health machine. Dentists in America who wish to educate their patients to the inefficiencies of nationalized health service can do no better than to place a marked copy of the Autumn 1949 issue of *The Practitioner* on their reception room tables.

1. Penman Report, page 240 this issue.
2. National Health Service Act in Great Britain. *The Practitioner*, Autumn 1949 issue. International Practitioner Co., 19 East 41st St., New York. Price $2.00.
3. Ibid, page 57.

THE NATIONAL SCENE

from The Journal's Washington Correspondent

Two weeks after opening of the 1950 session of Congress, Sen. Lester C. Hunt had his new national health bill in shape for introduction, subject to possible inclusion of changes suggested by the A.D.A. and other professional societies to which he turned for counsel. The Senator expected to introduce his bill by the first of February. Examination by *The Journal's* Washington correspondent of the final draft, which he discussed with the sponsor in mid-January, disclosed that it follows closely the principles enunciated by Senator Hunt when he addressed the A.D.A.'s 90th session in San Francisco last October.

If usual custom is followed, the measure will be referred to the Senate Committee on Labor and Public Welfare. Public hearings probably will be conducted by the subcommittee on health legislation, of which Sen. James E. Murray is chairman. Hence there is the prospect that late winter and spring will witness a number of Congressional hearings being conducted simultaneously and in which the dental profession is interested. Included, besides the Hunt bill, are proposed laws to amend the Social Security Act; make appropriations for U. S. Public Health Service, with its expanding activities in dental research, and merge all Federal health and hospital services into a United Medical Administration.

The three titles of Senator Hunt's proposal deal, respectively, with establishment of a Department of Health; financial aid to practitioners, hospitals and farmers' cooperatives in "shortage areas," and creation of a national health insurance system, membership in which would be voluntary and limited to individuals and families whose annual income is $5,000 or below. Most radical departure, in comparison with the idea which he outlined in San Francisco last fall, is that the deductible feature is all but eliminated. Subscribers would be covered for medical, dental, nursing and related expenses in excess of $5 for each 12-months period. Original intention of the Wyoming Senator was to make at least the first $50 deductible, perhaps as much as $100. He explained that the figure was lowered to $5 because he feared that otherwise there would be too much of a deterrent to enroll in the government plan.

Dentist on Board

Administering agency would be a five-member National Health Insurance Board, with the Surgeon General as chairman ex-officio. The President would appoint the other four: One from the dental profession, one representing hospitals and the other two from the public at large. Six-year terms of service are provided for in the Hunt bill and salaries of members are set at $15,000 annually. Free choice of physician and dentist is assured subscribers. Size of premium payments would be determined by the Board.

Title I of the bill calls for a Department of Health, with a Secretary of Health, Under Secretary and five Assistant Secretaries. Qualifications for the two top positions are identical: Each must be a physician or dentist with broad experience in medical or dental education. The Department of Health would assume all health and hospital activities

now performed by Federal Security Agency. Military and Veterans Administration medical functions would not be affected, though the bill provides for an investigation by a non-partisan commission whose ultimate task would be to recommend for or against consolidation of all Federal medical duties.

Health Cooperatives Subsidized

Title II authorizes loans and grants to practitioners and hospitals in "shortage" areas, particularly rural. One of its features is to guarantee incomes or contribute to operating expenses of physicians and dentists willing to settle in these areas, with special grants provided for transporting families and household goods. Subsidization of farmers' experimental health cooperatives also is included. Title II authorizes total appropriations of $50,000,000 annually.

Most interesting of other new legislative proposals in the health field is H.R. 6727, a bill introduced January 12 by Representative Kenneth B. Keating (Republican, N. Y.). Its objective is to forestall compulsory health insurance by providing attractive inducements to enroll in voluntary prepayment plans. These are in the form of income tax deductions. For example, if a person spent $20 for premiums in a prepayment plan in a given year and his income tax totaled $45, he would be permitted to deduct from 60 to 90 per cent of the $20 from the tax-due figure. Those with incomes above $10,000 would be allowed 60 per cent; $2,000 or below, 90 per cent, with intermediate incomes graduated accordingly.

There are other pending bills, introduced last year, that legalize such premiums to be listed as "contributions" or "expenses" but none which go as far as the Keating measure in permitting them to be subtracted from the tax figure itself. The sponsor, who is a Rochester lawyer, concedes that his plan would lower revenues considerably but argues that it would nevertheless be more economical than "the huge medical bureaucracy" that would be spawned by national compulsory health insurance.

The office of Dr. Bion R. East, assistant medical director of Veterans Administration, Department of Medicine and Surgery, has compiled a list of dental personnel recently elevated to the newly created professional status of "chief grade." They are divided almost equally between field and central office positions. The list is as follows: Central Office—Drs. James F. Amick, George M. Arrowsmith, L. M. Childers, J. E. Fauber, Edward Gilbert, William M. Goodwin, Jerome J. Hiniker, Edwin M. Kennedy, William D. Lanier, Joseph O. Mona, Sherman A. Pyfrin, Paul Richards; Field Positions—Drs. Herman Bouchet, Carlisle Carson, Clifton O. Dummett, H. L. Dute, Stephen F. Hardy, Erceil V. Millard, James W. Nixon, Earl B. Rousseau, Harry A. Single, Charles L. Toole, Robert E. Stewart.

Predict School Aid

The beginning of a new year in Washington displayed definite signs that contests will be numerous this year over a variety of legislative proposals, although few of them are expected to achieve final decisions before adjournment of the 81st Congress this summer. Chairman J. Percy Priest of the House subcommittee on health legislation predicted enactment of the bill for Federal aid to medical and dental schools, notwithstanding opposition expressed by the A.M.A.

It is regarded as almost certain that President Truman again will seek Department status for Federal Security Agency, precipitating another battle. The budget which he sent to Congress early in January omitted funds for construction of a National Dental Research Institute building and within a few days Dr. E. Harold Gale, chairman, and Francis J. Garvey, secretary, of the A.D.A.'s Council on Legislation were in the Capi-

tal to urge inclusion of at least an initial appropriation.

Medical and dental care provisions of the social security law amendment, as well as the question of coverage of dentists themselves under the act, will be argued pro and con during public hearings before the Senate Finance Committee in February.

Rep. Bosone's Health Aid Bill

Dropped into the House hopper on January 16 without preliminary fanfare was a bill sponsored by Utah's woman Representative, Mrs. Reva Beck Bosone, which calls for government compulsory health insurance of the deductible type. Coverage would be for medical bills in excess of $50 in each year and $25 for dental care. The program would be financed by a 3 per cent payroll tax, borne equally by employer and employe. Supplemental funds, if required, could be taken from the U. S. Treasury up to the limit of one per cent of the estimated annual average of all wages.

Mrs. Bosone, a widow serving her first term in Congress, said her scheme "may not be the answer to the problem but I feel it has enough merit that it should be considered." She confided that her sponsorship of the bill was due, in part, to the urgings of a Washington friend who is a practicing dentist.

A three-year trial of the program is specified. It would expire June 30, 1954, unless Congress extended it. Payroll deductions would be compulsory on virtually the same basis, with reference to the number of workers involved, as provided for in the Thomas-Murray-Dingell bill backed by the Administration. General administration is placed under control of Federal Security Agency.

Fee schedules would be fixed independently by state health groups, each comprising six physicians, three dentists, two nurses, two hospital supervisors and two pharmacists. "Members of each board are to be appointed by the medical society having the largest membership in the state," says the bill. The fee schedules which they establish must be "in accordance with regulations of the (Federal Security) Administrator."

The bill defines dental services to include all usual preventive and therapeutic care, prosthetic work and services of dental technicians as well as dentists among them. Free choice of physician and dentist is guaranteed.

A. D. A. AFFAIRS

A.D.A. JOINS STEERING COMMITTEE OF WHITE HOUSE CONFERENCE

At the invitation of Mr. Leonard W. Mayo, Chairman of the Executive Committee, Midcentury White House Conference on Children and Youth, the A.D.A. has accepted a membership on the Steering Committee of the Advisory Council on Participation of National Organizations.

The Steering Committee, made up of representatives from 60 organizations, will carry heavy responsibilities in that it will speak for several hundred members in the fields of health, welfare, recreation, citizenship, religion, business and others. It will advise on Conference projects, fact finding and communications.

In accepting the invitation, Harold Hillenbrand, Secretary, said that the A.D.A. "will be glad to make any contribution possible to the attainment of the announced objectives" of the Conference, but that "it should be pointed out that acceptance of the invitation

does not modify the Association's position that the dental profession is properly entitled to representation on the National Committee."

A.D.A. RELIEF FUND CAMPAIGN HALF WAY TO $100,000 GOAL

A total of 21,116 contributors to the A.D.A. Relief Fund had donated a total of $49,035.67, through purchase of Christmas Seals, up to January 15, almost half way to the 1949-50 goal of $100,000.

John S. Owens, of Camden, N. J., chairman of the Council on Relief, recently pointed out that the number of dentists and their families applying for Relief Fund assistance is increasing and made an appeal for generous contributions. Each contribution will be divided equally between the A.D.A. Relief Fund and the relief fund of the state dental society to which the contributor belongs.

A.D.A. FISCAL YEAR CHANGED TO JANUARY 1

Starting with 1950, the fiscal year of the A.D.A. began on January 1, instead of June 30 as has been the former policy.

The new scheduling will conform to the dues year and will enable the Board of Trustees to plan the year in advance at their October meetings. The Board will now be able to adopt budgets in October which will become effective at the beginning of a new calendar year instead of at the half way mark.

A.D.A. REPRESENTATIVE TO NEW ZEALAND FOR STUDY

At a January 7 meeting of the Ad Interim Committee of the Board of Trustees at the Statler Hotel in New York, it was decided to send an A.D.A. representative to New Zealand, at the request of the State Department, to study the training and activities of that country's dental nurse program.

The Board of Trustees approved the Committee's decision and voted to appoint Allen O. Gruebbel as A.D.A. representative with instructions to make a comprehensive and objective survey of the New Zealand program.

Dr. Gruebbel, Secretary of the Council on Dental Health, will leave the middle of February for a stay of two and a half to three months. He will arrive soon after the opening of New Zealand's fall school term and will thus have the opportunity of studying the dental nurse's part in caring for students' dental health, including the nurses' training for such positions.

Upon his return to the United States, Dr. Gruebbel will submit a full report to the Board of Trustees.

CHILDREN'S PROMOTION HITS NEW PEAK, FEBRUARY 6

The 1950 observance of National Children's Dental Health Day on Monday, February 6, will be the most widespread campaign in the history of the A. D. A., with hundreds of communities sponsoring programs to promote dental health for their youngsters.

The nation's dentists will join with parents, teachers, health educators and civic leaders participating in local and district programs for the purpose of helping to establish dental health education and care available to all children.

More than a score of state governors and hundreds of mayors have agreed to issue proclamations urging public support of the observance. As an aid to committee chairmen and state and district society secretaries, packets of publicity and promotional material were mailed from the A. D. A. Public Information Office for use in state and local programs.

Appointed A.D.A. Cashier

Miss Dorothy Wright, of Chicago, on December 13, was appointed head of the accounting division of the American Dental Association Central Office, succeeding Mr. O. T. Evans.

Miss Wright is particularly well qualified for the responsible position. Prior to becoming assistant chief accountant of the association seven years ago, she was for several years office manager of the Chicago Historical Society.

CONCIOUSNESS OF DENTAL HEALTH SEEN IN DEMAND FOR MATERIAL

Requests for education and promotion material for the 1950 National Children's Dental Health Day (February 6) have greatly exceeded the available supply, according to Allen O. Gruebbel, Secretary of the A.D.A. Council on Dental Health.

Because of an unexpected demand the limited supply was prorated among the constituent societies, with packets containing guidance and publicity aids, posters and educational booklets being shipped early in January.

C. L. Sebelius, chairman of the Dental Health Education Committee, and A. R. Sample, chairman of the Public Relations Committee, Tennessee State Dental Association, stated in a letter to members that "The value of the project will only be in proportion to the energies put forth by each individual dentist. If Children's Dental Health Day is going to have permanent worth it is going to be up to the initiative and sincerity of each dentist working collectively with others to formulate a workable program."

Drs. Sebelius and Sample suggested as a guide the following activities: (1) group meetings with consumer groups to discuss the dental needs of the community's children and to plan a definite dental health program; (2) speakers at civic clubs; (3) radio; (4) newspaper publicity; (5) observance at schools on Children's Dental Health Day; (6) local

proclamations; (7) motion picture programs; (8) local society meetings devoted to dentistry for children; (9) newspaper advertising.

A.D.A. MEMBERSHIP AT HIGHEST PEAK IN 1949

Membership in the A.D.A. reached 75,609 at the end of 1949, the highest total yet, according to Holly Jarvis, Cincinnati, Chairman of the Membership Committee, who pointed out that this means an increase of 3,561 over 1948, with 342 dentists joining last December.

Active (Paying) members numbered 65,519, a decrease of one per cent from 1948. However, membership of dental students increased 113.2 per cent for a total of 7,205 in that group. There were 364 life memberships granted in 1949 which increased that classification to 2,511. The total of all membership classifications shows an increase of almost five per cent.

Active members in other categories increased 20 per cent. Air Force dental officers numbered 94, and 235 in the Army Dental Corps. Navy Dental Corps membership in the A.D.A. increased 43.4 per cent for a total of 476. The highest increase was in the Public Health Service with an increase from 125 in 1948 to 197 members last year for a percentage gain of 57.6.

Of the 7,205 student members, New York university's dental school claims the highest number with 482, with Temple running a close second with 456 members. Other schools with more than 300 dental student members are the University of Kansas City with 387; Loyola University (Chicago), 318, and the University of Pennsylvania, 305.

ACTIVE MEMBERS CONSTITUENT SOCIETIES

Constituent	December 31, 1949	December 31, 1948	Percentage change
Alabama	522	533	—2.1
Arizona	166	162	2.5
Arkansas	316	308	2.6
California	2,380	2,330	2.1
Southern California	2,802	2,750	1.9
Colorado	577	562	2.7
Connecticut	1,259	1,276	—1.3
Delaware	95	88	8.0
District of Columbia	534	567	—5.8
Florida	768	734	4.6
Georgia	672	673	— .1
Hawaii	233	220	5.9
Idaho	175	160	9.4
Illinois	4,950	5,079	—2.5
Indiana	1,544	1,616	—4.5
Iowa	1,253	1,286	—2.6
Kansas	744	768	—3.1
Kentucky	713	736	—3.1
Louisiana	674	684	—1.5
Maine	302	324	—6.8
Maryland	675	673	.3
Massachusetts	2,471	2,515	—1.7

Michigan	2,549	2,585		—1.4
Minnesota	1,984	2,060		—3.7
Mississippi	324	325		— .3
Missouri	1,740	1,806		—3.7
Montana	227	229		— .9
Nebraska	752	776		—3.1
Nevada	65	64		1.6
New Hampshire	191	204		—6.4
New Jersey	2,783	2,737		1.7
New Mexico	128	131		—2.3
New York	10,419	10,564		—1.4
North Carolina	801	790		1.4
North Dakota	222	224		— .9
Ohio	3,195	3,200		— .2
Oklahoma	597	598		— .2
Oregon	743	765		—2.9
Panama Canal Zone	19	18		5.6
Pennsylvania	4,741	5,016		—5.5
Puerto Rico	193	200		—3.5
Rhode Island	354	367		—3.5
South Carolina	259	298		—13.1
South Dakota	227	235		—3.4
Tennessee	716	737		—2.8
Texas	1,991	1,910		4.2
Utah	302	301		.3
Vermont	135	133		1.5
Virginia	736	726		1.4
Washington	1,099	1,088		1.0
West Virginia	482	540		—10.7
Wisconsin	1,941	2,022		—4.0
Wyoming	107	114		—6.1
Total active members in Constituent societies	63,847	64,807		—1.5
Active members in other categories				
Air Force	94			
Army	235	286		15.0
Navy	476	332		43.4
Public Health Service	197	125		57.6
Veterans Administration	645	647		— .3
Unorganized	25	3		733.3
Total active members in other categories	1,672	1,393		20.0
TOTAL ALL ACTIVE MEMBERS	65,519	66,200		—1.0

HOUSE DENTAL HEALTH PROGRAM AVAILABLE IN BOOKLET FORM

A statement setting forth basic principles for a dental health program for the community, state and nation was a major accomplishment of the House of Delegates at the 90th annual session last October. So that every dentist and his patients may know the details of this counter-proposal to federal health insurance, the statement has been made available in booklet form.

The statement reiterates the A.D.A.'s basic objections to compulsory health insurance in the United States, and recom-

mends workable programs which will result in improved dental health for the American people.

Any member desiring one or more of these booklets may obtain them by writing to the Bureau of Public Information, 222 E. Superior St., Chicago 11.

SENATE JUDICIARY COMMITTEE O.K.'s HEALTH DAY PROCLAMATION

The Judiciary Committee of the U. S. Senate on January 16 unanimously approved a joint congressional resolution (H.J. 184) which would authorize President Truman to proclaim National Children's Dental Health Day.

As THE JOURNAL went to press, the resolution had been approved by the House and had been written into the Senate calendar, with the expectation of being approved, thus clearing the way for a Presidential proclamation for the nation-wide observance planned for Monday, Feb. 6.

CORRECTION ON SCIENTIFIC EXHIBIT AWARD

In listing the award winners of the Scientific Exhibit Section of the Ninetieth Annual Session, the December JOURNAL erroneously reported that first prize was awarded to Pennsylvania State College for its exhibit on cleft palate prosthesis.

The exhibit was presented by C. S. Harkins and William S. Harkins of Osceola Mills, Pa., and J. F. Harkins of Erie, Pa., all of whom jointly received first prize. Pennsylvania State College was a co-sponsor.

DENTAL SOCIETIES

RECORD ATTENDANCE EXPECTED AT D. C. POSTGRADUATE CLINIC

Pointing to a steady increase in attendance at the Annual Postgraduate Clinics of the District of Columbia Dental Society in recent years, William Brown Ingersoll, General Chairman, has predicted a record-breaking total of 5,000 will attend the 1950 meeting.

The 18th Postgraduate Clinic will be held March 12-15 at the Shoreham Hotel, during Sesquicentennial Year in the nation's capital. In keeping with this milestone year, plans are under way for the Clinic's most ambitious scientific and social programs yet attempted, Dr. Ingersoll said.

To illustrate the growing popularity of the Clinics, Dr. Ingersoll cited figures for the past. In 1947, dentists attending the Clinics numbered 1,132; there were 1,360 registered in 1948 and 1,634 last year. Other classes of registrants in 1949 made up a total of 3,305, he said.

J. Garrett Reilly and Francis J. Fabrizio have been appointed Vice Chairmen for this year's Clinic, with Roscoe G. Lamb as Treasurer, Albert G. Paulsen, Secretary, Herman F. Bernstein in charge of Clinics, Alvin A. Shapiro, Promotion and Public Relations, Walter A. Rath, Entertainment, Bruno G. Floria, Program, Grant Kirkham, Commercial Exhibits, and John D. Callander, Registration.

All communications should be addressed to the Executive Secretary, D.C. Dental Society, 1835 Eye St. N. W., Washington 6.

AKRON DENTAL SOCIETY IN 10TH OBSERVANCE, HEALTH WEEK

Members of the Akron (Ohio) Dental Society will hold their 10th Annual Children's Dental Health Week program beginning on Monday, February 6, with a variety of activities to spur public interest.

According to Herman L. Goldfarb, chairman of the program committee, dental education will be stressed in grade and high schools during the week with sufficient momentum to carry it through the year. The Akron society will sponsor a poster contest in the schools, with three prizes to be awarded in the grades and three in high schools.

Dr. Walter T. McFall, of Asheville, N. C., will speak to members and guests of the Akron Dental Society at a dinner meeting on February 6 at the Mayflower Hotel. He will also address a radio audience over one of the Akron stations. Broadcasts by Akron dentists will also be featured.

Animated cartoons on dental health will be shown in local theaters and motion pictures will be shown to school assemblies. Other features of Akron's ambitious program include window displays in many drug and department stores and the distribution in over 60 schools of available brochures listing children's dental material.

CLEVELAND CELEBRATES ITS 10TH DENTAL HEALTH DAY

On Monday, Feb. 6, when the nation's dentists will join with all persons concerned with children's dental health in observing the Second National Children's Health Day, the Cleveland Dental Society will mark its 10th year of such a program.

The Cleveland society inaugurated Children's Dental Health Day a decade ago with special programs on dental health for the laity and scientific meetings stressing children's dentistry for the profession. The program proved to be sufficiently popular to warrant making it a national event.

Spokesmen for the dental profession feel that it owes a debt of gratitude to the Cleveland Dental Society for the important part it played in starting the machinery for an annual observance which brings national attention to children's dental needs.

DENTAL EDUCATION

J. C. BRAUER RESIGNS AS DEAN OF U.S.C. DENTAL SCHOOL

J. C. Brauer, Dean of the University of Southern California School of Dentistry, has resigned that post effective February 1.

An Administrative Committee composed of Rex Ingraham, chairman, Fred Olds and Donald Smith will conduct the administrative affairs of the school. Dr. Brauer is expected to announce his future plans soon after the date his resignation becomes effective.

TEACHING BY TELEVISION LAUNCHED AT ILLINOIS DENTAL

While television has been used frequently as a means of demonstration for medical students, the medium will be used for the first time as part of a prescribed course in teaching dentistry by the University of Illinois College of Dentistry on Feb. 10 and 11.

The course is being given on those dates for the convenience of dentists from areas other than Chicago who will attend the Midwinter meeting of the Chi-

cago Dental Society. Isaac Schour has announced that television will play a major part in the two-day postgraduate course in "Theory and Practice of Periodontics."

Through the cooperation of Station WBKB-TV, dentists will view such subjects as normal histology and physiology, pathology of the supporting tissues, clinical appraisal, evaluation of clinical methods in periodontal treatments and classification of periodontal diseases.

Additional information may be obtained from the Division of Postgraduate Studies at the University of Illinois College of Dentistry.

PAUL H. JESERICH NAMED DENTAL DEAN AT ANN ARBOR

P. H. Jeserich

Appointment of Paul H. Jeserich as dean of the School of Dentistry at the University of Michigan, effective July 1, has been announced by Pres. Alexander G. Ruthven.

Russell V. Bunting, dean since 1937, will begin his retirement furlough at that time.

In making the announcement, the University President said that "the School of Dentistry has made remarkable progress under the leadership of Dr. Bunting," and that the "faculty of the School, executives of the University and members of the Board of Regents are agreed that the broad interests of Dr. Jeserich, his professional knowledge and his ability to work with the profession will keep the School of Dentistry in the preeminent position which it has long occupied."

Dr. Jeserich, a faculty member since 1933, has also been director of the W. K. Kellogg Foundation Institute since 1936. He is a member of several professional and honorary societies including the American Dental Association, the Michigan State Dental Society, the American Academy for the Advancement of Science and the National Research Council. He received his D.D.S. degree from the University of Michigan in 1924.

ORTHODONTICS COURSE OFFERED BY UNIVERSITY OF TORONTO

Applications will be received up to March 1st for the graduate course in Orthodontics at the University of Toronto, according to an announcement by the University's Faculty of Dentistry.

The course will commence on September 1st and is limited to six graduates of approved dental schools. Applicants must possess satisfactory scholastic standing acceptable for enrollment for the Master of Science (Dent.) degree in the School of Graduate Studies of Toronto University.

The course is under the direction of Robert E. Moyers, Professor and Head of the Department of Orthodontics. Further information and applications may be obtained by writing the Dean, Faculty of Dentistry, University of Toronto, 230 College St., Toronto, Ontario, Canada.

LEGISLATION

SEE DENTIST RECOGNITION IN MASSACHUSETTS BILL

Since Massachusetts courts have consistently refused to extend the meaning of the word "physician" by implication to include licensed dentists, the profession will be interested to note the change of wording in its favor in a bill submitted to the Massachusetts State Legislature.

House Bill 1277 provides for the establishment and administration of sickness disability compensation (cash sickness insurance). The prospective law would provide cash benefits to employees whose employment is terminated by sickness or disability not incurred on individual jobs. The fund to supply the benefits would come from both employer and employee on a 50-50 basis.

One of the requisites for an employee's eligibility for benefits under the prospective law is the "procurement of a physician's certificate setting out the nature of the employee's sickness or disability." The bill defines "physician" as an individual licensed to practice medicine *or* dentistry, thereby expressly extending, for the first time, the meaning of "physician" to include licensed dentists.

PUBLIC HEALTH

WORLD HEALTH ORGANIZATION OFFERS FELLOWSHIPS

Of interest to dental educators and those engaged in dental public health activities is the announcement by the Federal Security Agency that the World Health Organization is offering fellowships to the dental profession.

The W.H.O. is making available to the United States an allotment of nine to 12 fellowships available this year for foreign study in the field of health, according to a statement from Henry R. O'Brien, M.D., Chief of the Educational Programs Branch in the Division of International Health.

For 1950, applications will be considered in the fields of public health administration, malaria, tuberculosis, maternal and child health, venereal diseases, sanitation, nutrition and mental health. Applicants must be engaged in some form of full time public health work, including medical, dental or nursing education.

Grants are for periods of two or three months for observation and up to a year for study. The W.H.O. will provide transportation abroad and in the country visited, with a stipend of $200 a month for those studying in one place and $300 for those moving about.

Application blanks may be obtained from the Educational Programs Branch, Division of International Health, U. S. Public Health Service, Washington, D. C., and must be returned not later than March 1.

JOHN T. FULTON AWARDED WORLD HEALTH FELLOWSHIP

J. T. Fulton

John T. Fulton, dental adviser in the Children's Bureau, Federal Security Agency, has been awarded a fellowship by the World Health Organization to study children's dental services provided by the New Zealand Health Dept.

In announcing the award, Dr. Robert Lambert, fellowship consultant of the W.H.O.'s Pan American Sanitary Bureau, said that Dr. Fulton will leave for New Zealand on February 11 and return to Washington in mid-April. His trip has been planned to coincide with New Zealand's fall school term opening, since his study will deal largely with school children. Prior to joining the Children's Bureau in 1944, Dr. Fulton was in charge of children's dental services in the Connecticut Health Department.

DENTIST NAMED FOR ILLINOIS PUBLIC HEALTH BOARD

Through the efforts of the president, John W. Green and the officers of the Illinois State Dental Society during the past year, a dentist has been appointed to the Board of Public Health Advisors for the state's Department of Public Health.

The Board, previously made up only of physicians, now comprises one dentist, three physicians and a business man. The dentist announced by Gov. Adlai Stevenson as the first of his profession to hold this important position is Lloyd H. Dodd of Decatur.

Dr. Dodd is a former president of the Illinois State Dental Society and a prominent lecturer on various subjects related to practice management in dentistry. The society's officers expressed the opinion that the appointment of a dentist to this important committee is a definite achievement, for dentistry now holds a prominent place in the health program.

RESEARCH

DENTAL RESEARCH FELLOWSHIPS TO BE AWARDED FOR ONE YEAR

Ten research fellowships will be awarded for one calendar year in the fields of medicine, dentistry and pharmacy by the University of Illinois Graduate College in Chicago.

The fellowships include stipends of $1,800 per year for medical and dental graduates and $1,200 for pharmacy graduates, with exemption from tuition fees for all appointees. In unusual cases, a $2,400 stipend may be awarded to those holding a Doctor's degree. Registration in the Graduate College for full time credit toward M. S. or Ph.D. degrees is required.

The fellowships are designed primarily for graduates in the early stages of preparation for a teaching career in medical and dental problems, although time credit toward specialty board requirements in basic sciences is recognized.

Appointments will be announced March 1 for fellowships beginning July 1 or September 1, 1950. Formal application blanks may be secured from the Assistant Dean, The Graduate College, University of Illinois, 808 South Wood Street, Chicago 12, Ill.

ARMED FORCES

NEW EXECUTIVE OFFICER AT NAVAL DENTAL SCHOOL

Comdr. Alvin H. Grunewald, DC, USN, assumed duties as Executive Officer of the Naval Dental School, Bethesda, Md., with the new year, relieving Capt. Merritt J. Crawford, who was assigned to a new duty station at Alameda, Calif. Captain Crawford had held this post since October, 1945.

The official announcement of Commander Grunewald's assignment stated that since graduating from Marquette University Dental School in 1931 and his entrance into the Naval Dental Corps in 1935, he has served on three ships and eight shore stations. He was at Pearl Harbor when World War II hostilities began and was District Dental Officer in Alaska when the conflict ended. For the past two years he has been engaged in research on dental materials at the National Bureau of Standards.

Commander Grunewald's affiliations in the dental profession include chairmanship of the Section on Full Denture Prosthesis of the A.D.A., Fellowship in the American College of Dentists, Fellowship in the Academy of Denture Prosthetics, membership in the American Denture Society and in the International Association of Dental Research.

COL. BEVERLEY M. EPES AWARDED CERTIFICATE OF ACHIEVEMENT

The Army Certificate of Achievement has been awarded to Col. Beverley M. Epes, who until recently was Dental Surgeon of the famed Third Army with headquarters at Fort McPherson, Ga.

Col. Epes was presented the certificate by Lt. Gen. Alvan C. Gillen, Jr., Commanding General, on the eve of Col. Epes' departure for a tour of duty in the European Command.

The Certificate said in part that Col. Epes, "by application of his professional ability, thorough diligence, determination and initiative, maintained an effective Army dental service and contributed materially to the health of the Command. The outstanding manner in which Col. Epes performed his assigned mission reflects great credit to himself, the Dental Corps and the Third Army."

Col. Epes, the son of Mrs. Peter Epes of Blackstone, Va., is a graduate of the Emery University School of Dentistry, and practiced for several years in Blackstone prior to entering the service.

GENERAL NEWS

COOK-WAITE LABORATORIES RECALL FAULTY ANESTHETIC

Certain lots of local anesthetic solutions are being recalled by the Cook-Waite Laboratories, Inc., according to Everett L. Hoskins, president of the concern, who has advised all dentists using Cook-Waite solutions to check their stocks.

By mid-December, the laboratory had received a total of 77 complaints from dentists and distributors, that post-operative swelling sometimes associated with pain in the area of injection occurred after the use of certain anesthetic solutions.

Laboratory scientists believe that the cause of the irritating actions reported can be attributed to the chemical treatment of New York's water supply necessitated by the drought. To eliminate this cause and to preclude its occurrence, Cook-Waite is installing new equipment and will follow new procedures.

The lots being recalled carry the following code letters: *MB, OB, NB, TB* and *HB.*

ILLINOIS ALPHA OMEGANS TO HOLD ANNIVERSARY DINNER

Joseph Solow, Secretary of Alpha Omega fraternity, Illinois Alumni Club, has announced that the Illinois chapter will celebrate its 20th anniversary with a dinner at Chicago's Congress Hotel on Sunday evening, February 5. Dinner and professional entertainment will be provided.

PSI OMEGA TO MEET FEB. 5 AT CHICAGO'S HOTEL STEVENS

The Upper Tower Ball Room of the Stevens Hotel in Chicago will be the scene of the annual Psi Omega fraternity dinner on Sunday, February 5. As usual a fraternity room has been reserved for the week of the Chicago Dental Society meeting.

Reservations for members and their ladies may be secured by writing or calling Vincent B. Milas, 2559 W. 63rd St., Chicago.

LOYOLA DENTAL ALUMNI TO HOLD LUNCHEON MEETING FEBRUARY 8

The North Ballroom of the Stevens Hotel will be the scene of the annual Alumni luncheon of Loyola University's Chicago College of Dental Surgery on Wednesday, February 8, at 12-noon.

Alumni officers expect a large attendance, since the luncheon will be held dur-

ing the Midwinter meeting of the Chicago Dental Society. Tickets may be purchased at the Alumni headquarters room or at the door.

INTER-ASSOCIATION COMMITTEE HOLDS SECOND MEETING

The Inter-Association Committee, formed last November to seek methods of improving the nation's health, held its second meeting in New York on Jan. 7 to discuss further a common understanding on health problems.

The A.D.A. is represented on the Committee by Philip E. Adams, President; Harold Hillenbrand, Secretary; William McGill Burns, trustee, Brooklyn and Kenneth A. Easlick, Ann Arbor, Mich.

Other organizations participating in the Committee are: the American Hospital Association, the American Medical Association, the American Nurses Association, the American Public Health Association and the American Public Welfare Association.

Mr. John N. Hatfield, president of the A.H.A., acted as chairman of the New York meeting in the system of rotation among representatives. The Committee did not pass on any actions, but scheduled the next meeting for March 25 in charge of the A.M.A., also to be held in New York.

PERCY PHILLIPS' RECORD ON "VOICE OF AMERICA"

European listeners to the State Department's "Voice of America" programs in December, heard a talk on modern dentistry in the United States by Percy T. Phillips, Speaker of the House of Delegates. It was recorded from a speech he gave before the 25th annual Greater New York Dental Meeting which was then holding its concluding session.

The talk was broadcast over a number of transmitters at different times, to reach foreign listeners at periods when it is believed the largest possible number of people are tuned in.

DELTA SIGMA DELTA TO HOLD COCKTAIL PARTY FEBRUARY 5

Members of Delta Sigma Delta fraternity will gather in private dining room Number One of the Stevens Hotel, on Sunday, Feb. 5, to renew old friendships at a cocktail party.

Program Chairman Russell G. Boothe has announced that activities will begin at 5:00 p.m. and last until 7:00. Dr. Boothe has also reserved a private room where members may gather. The number of the room will be announced at the party.

CHICAGO XI PSI PHI TO HOLD ANNUAL BANQUET

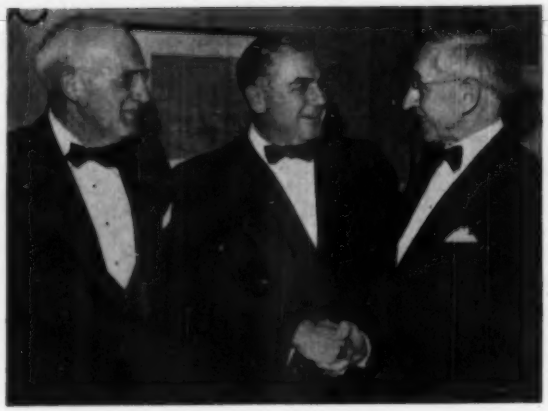
The Chicago Alumni Chapter of Xi Psi Phi fraternity will hold its Annual Fraternity Banquet on Sunday, February 5, in the West Ball Room of the Stevens Hotel.

All visiting members are invited to the cocktail hour which commences at 6:00 p.m. and to the 7:00 dinner.

ILLINOIS DENTAL ALUMNI LUNCHEON FEBRUARY 8

The annual luncheon of the Dental Alumni Association of the University of Illinois will be held on Wednesday, February 8, at the Stevens Hotel, in conjunction with the Midwinter meeting of the Chicago Dental Society.

The luncheon will be held at 12 noon in the South Ballroom. Registration will be conducted in Room 556A in the Stevens.



U. S. Senator Brien McMahon, the principal speaker at the Horace Wells Club's 55th Annual Meeting, receives plaudits for his talk from retiring president E. Harvey Richmond (R.) and H. Gildersleeve Jarvis, honorary member

HORACE WELLS CLUB HEARS SEN. McMAHON ON 55TH ANNIVERSARY

The Horace Wells Club, the offspring of the Quonehtacut Dental Club, celebrated its 55th Anniversary in Hartford, Conn., with a formal dinner, election of officers and an address by Sen. Brien McMahon late in December.

Senator McMahon spoke to the dentists and their guests on the subject of atomic energy and control, speaking authoritatively as the chairman of the Joint Congressional Committee on Atomic Energy. The senator said that he is supporting a policy of putting "money and renewed effort behind getting through the chinks in the iron curtain."

Roger Offen was elected president of the club for 1950, with Earl Arnold as vice-president and Eugene Clifford as secretary.

DENTAL PROFESSION ASKED TO AID IN MARCH OF DIMES

The 1950 March of Dimes, which began on January 16, will be one of the most critical campaigns ever waged by the National Foundation for Infantile Paralysis in its 12-year fight against polio.

Unprecedented demands for polio care have depleted the funds of the Foundation and its 2,819 chapters. During 1949 between 40,000 and 45,000 children and adults were stricken in the worst polio epidemic ever experienced by this nation.

Financial problems involving the care of patients are becoming increasingly difficult, according to the Foundation, and this year it asks that dollars instead of dimes be contributed.

DR. STRUSSER HONORED ON 20TH YEAR OF PUBLIC SERVICE

More than 200 members of the dental staff of the Department of Health of New York City recently celebrated the 20th anniversary of Harry Strusser's leadership as chief of the dental services.

Among the leaders of the teaching and dental professions who paid spoken tribute to Dr. Strusser's accomplishments were Dr. I. H. Goldberger, of the Dept. of Education, Dr. Walter Wright, Dr. Leuman Waugh and Deputy Commissioner Samuel Frant.

The Oral Hygiene Committee of Greater New York presented Dr. Strusser with an illuminated scroll in appreciation of his public service and his services

to the dental profession. The hand-lettered scroll was presented in "recognition of his devotion to the welfare of the children of New York City and his outstanding contribution to the improvement of their dental health."

DENTAL ASSISTANTS ELECT NEW OFFICERS

The American Dental Assistants Certification Board, Inc., has announced their newly-elected officers as follows: Chairman, Nellie Mitchell, 615 Wiley Bldg., Hutchinson, Kan.; Vice Chairman, Katie McConnell, 427½ Moreland Ave., N.E., Atlanta, Ga., and Secretary-Treasurer, Ruth V. Doring, 85 Park St., Montclair, N. J.

NEW YORK MEETING TO DISCUSS PAPANICOLAU SMEAR TECHNIC

"What the Papanicolau Smear Technique Means to the Dentist" will be the topic of a meeting of the New York Section of the American Academy of Dental Medicine on Tuesday, February 28, according to Ruth Aron, editor of the New York Chapter.

A report will be given of an investigation carried on in the Department of Periodontia, New York University School of Dentistry, under the supervision of Samuel Charles Miller, head of the department. The researchers studied the normally exfoliated cells of the oral mucosa by means of the Papanicolau smear technic, using representative samples from young male students.

In addition to a preliminary report dealing with changes in the oral mucosa of females, the application of this technic in the diagnosis of abnormal conditions of the mouth and as an adjunct to diagnosis by biopsy will be discussed.

The meeting is scheduled to be held at Freedom House, 20 West 40th Street. Dr. Aron may be contacted at 57 West 57th Street, New York 19.

INDIAN AGENCY ANNOUNCES POSITIONS FOR DENTIST

In a communication to the A.D.A. Council on Dental Education, Mr. A. B. Caldwell, Educationist with Five Civilized Tribes Agency at Muskogee, Okla., has launched a preliminary inquiry to determine the interest of dentists in entering Indian work.

According to Mr. Caldwell, his Agency hopes to establish a position for a dentist to serve the boarding schools in Eastern Oklahoma. He requests that interested persons contact him in the near future.

The position would come under the U. S. Department of the Interior, in the Field Service of the Office of Indian Affairs.

PHYSICIANS, DENTISTS INVITED TO USE DOMUS MEDICA

Dentists and physicians who plan to visit a foreign country for study or recreation, may write for information to Domus Medica, International Center of Medical Welcoming Organizations, which has opened a new office in Chicago.

Domus Medica has corresponding offices in major cities the world over, and welcomes inquiries for information on international contacts as well as for cultural, scientific, artistic and tourist viewpoints.

The Chicago delegate of Domus Medica is Dr. Valentin Charry, 111 East Oak St., Chicago.

INTERNATIONAL CORRESPONDENCE

NEWS FROM GREAT BRITAIN

The British dental profession moves from one anxiety to another. The latest cause for concern, one which has received but scant attention in the past, concerns the dilution of the profession by trained auxiliary personnel.

A difference of opinion exists among dentists regarding this problem. Some demand united support for the policy of the B. D. A., which steadfastly opposes dilution. Others believe that the use of trained auxiliary personnel would be advantageous, and speak highly of their services in the R. A. F.

To this group the problem is whether the services of the hygienist should be limited to scaling and minor gum treatment or whether she should be permitted to perform certain other operations such as is done by the New Zealand nurse.

At present, those who oppose dilution seem to be in the majority although many dentists have given the matter little thought. A delegation from the Ministry of Health is to visit New Zealand during the next few weeks to study the services of the dental nurse. So far the dilution of the profession by dental technicians seems out of the question although it is a dilution that is most feared.

The New B. D. A.

The Interim Representative Board of the British Dental Association has held its first meeting since the new Association was organized December 1. Officers elected were: W. R. Tattersall, Chairman; T. Hindle, Vice Chairman; A. P. Husband, Council Chairman; J. Lauer, Council Vice Chairman.

At the last meeting of the representative board of the B. D. A. prior to amalgamation, it was moved that the B. D. A. support the Public Dental officer's request that Whitley Council Machinery be set up as soon as possible in order to establish a salary scale for Public Dental Health officers. The motion was tabled until the matter could be discussed by the new board. This action bitterly disappointed the Public Dental officers and they withdrew from the meeting.

Later a reconciliation was achieved and at this first meeting of the Interim Representative Board, Whitley Council Machinery was discussed in detail. It was agreed, subject to the drafting of a satisfactory constitution for an autonomous Dental Whitley Council, including, among others, a committee for P. D. O.'s, that the Association would cooperate in setting up such a council.

It was further agreed that the staff side of the council would consist entirely of members nominated by the profession. The board also approved the principle of establishing a general Dental Services Committee similar to the Medical Service Committee of the B. M. A., which is most beneficial. The fact that these two important decisions were taken within ten days after the formation of the new Association indicates that no time is being lost. The amalgamation of the three dental societies was achieved cheerfully, which augurs well for the future of the new Association.

The School Dental Service

The Minister of Education estimates that about one dentist to 3,000 children would be required to furnish complete school dental service, including inspection and treatment. As of January, 1949, local authorities employed about 868 full time school dentists. At that time an addi-

tional 975 were needed to bring the ratio up to one dentist to 3,000 children. During the past year the number of school dentists has decreased seriously.

The National Health Service

Recent amendments to the National Health Service provide that a charge of one shilling be made for each prescription dispensed. The amendments also empower the Minister of Health to recover the cost of services provided under the National Health Service to persons not ordinarily residing in Great Britain.

Faculty of Dental Surgery

The Second Annual Report of the Faculty of Dental Surgery of the Royal College of Surgeons of England includes the following points of interest. "Since the Annual Meeting of the Faculty, the Dean and Vice Dean have made an extensive tour at the invitation of the Nuffield Foundation to observe and report upon American methods of education in dentistry.

"During the year the Board has striven to fulfill the objects for which the Faculty was formed, to advance the science and art of Dental Surgery and to encourage study and research in that field and in closely related subjects. The courses of instruction in the basic sciences and the lectures in General Oral and Dental Surgery have continued and have been well attended. A Professor of Dental Pathology has been appointed. Twenty-three candidates have satisfied the examiners in their final examination and 35 in their primary examination for the Fellowship in Dental Surgery of the College.

"There are 69 new licentiates. Sixty-one dental surgeons have been elected to Fellowships in Dental Surgery by the Council.

"The Board accepted the views of the Interdepartmental Committee on Medical Schools that a specialist is the product of approved postgraduate training and experience in an approved institution for a prescribed period; that this training should include general clinical experience and study of at least one of the basic sciences as well as specialist training.

"This training should culminate in the acquisition of a dental qualification which would be recognized as conferring specialist status. The qualifications for, and standards of specialist status should be determined by some central machinery. The Board of Faculty expresses its willingness to share in this responsibility if so desired.

"Requirements of prospective specialists can not be met by part time study, nor should a specialist engage in general practice; a specialist should devote himself wholly to his specialty."

Training Oral Hygienists

A scheme for training women as oral hygienists is being organized by the Ministry of Health so that an adequate test can be made of their value in dentistry.

The Ministry of Health defines an oral hygienist as a woman "trained to perform the operation of scaling and polishing the teeth and generally cleaning the patient's mouth before the dentist begins treatment. They also advise the patient how to keep his mouth in a healthy condition; this is particularly important to children. The hygienist works under the responsible direction of the dentist."

The Ministry of Health believes that oral hygienists are capable of greatly improving dental health and in order to extend this object, courses of training for one year are being arranged.

Hygienists who obtain the Certificate of Proficiency, will be offered posts in either the hospital service or the public dental service. Employment in a private dental practice will not be open to them.

NEWS FROM NORWAY

The School Dental Service has always represented the most important part of Norway's public dental service, with more than 80 per cent of all children in elementary schools (7 to 14 years) receiving treatment. With this in mind, the Norwegian Parliament (Storting) recently passed a modernized plan for public dental care, according to S. Bryhn Ingebrigtsen, Head, Dental Division, Norwegian Health Service in Oslo.

The Public Dental Care Law is general in scope and includes children 6 to 18 years of age in the free dental care plan, all to receive treatment once a year. Expenses will be covered by the individual state (province) and municipality. The remainder of the population will have access to dental treatment when needed, at fixed rates.

Other features of the new law aim toward better dispersion of dentists in relation to population, care for children under school age and to give adults access to dental treatment at reasonable fees in local clinics throughout the country.

(Note: A more detailed discussion of this law will appear in a forthcoming issue.)

THE READER COMMENTS

THE JOURNAL devotes this section to comment by readers on topics of current interest to dentistry. The editors reserve the right to edit all communications to fit available space and require that all letters be signed. Signatures will be deleted before publication at the request of the author. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your individual participation in this section is invited.—The Editor.

ON DENTAL ALLOYS

With reference to the paper "A Survey of Dental Alloys" by Joseph R. Lane, published in the October, 1949, issue of THE JOURNAL, I should like to submit the following discussion.

Unfortunately, in some instances the author has omitted certain essential details without which the quoted data cannot be properly evaluated, and has stated as fact, without any supporting data, what appears to be merely his opinion. The purpose of this discussion is to supply some of the omitted essential details and to call attention to some of the specific points which require clarification.

On page 430, Mr. Lane states that the cast cobalt-chromium base alloys have greater strength than the partial denture casting gold alloys. Apparently in support of this statement, he submits data on the properties of casting gold alloys in his Table 4, page 429, and on cast cobalt-chromium alloys in his Table 7, page 432.

The data on casting gold alloys, submitted by the author, are taken from the 1939 edition of *Metals Handbook*, although more recent data are available in the 1948 edition of *Metals Handbook* and from numerous other sources. For example, values for strength of partial denture casting golds, taken from the 1948 edition, range up to 130,000 p. s. i. The test specimens used for determining these tensile properties were cast rods .070 inch to .090 inch in diameter and approximately 4½ inches long.

The data on cobalt-chromium base alloys presented in the author's Table 7 were taken from a paper by Nicholas J. Grant reporting work at the Massachusetts Institute of Technology on heat-resistant alloys for use in gas turbines to be operated at 1350-1500° F. It is worthy of note that the nature of the tests and the test conditions used in this work were aimed at developing useful information for this type of service rather than for dental service. Although Mr. Lane does not give the dimensions of the test specimens, reference to Dr. Grant's original report indicates that two types of specimens were used, one 4 inches long and the other 2½ inches long, both with .25 inch diameter center section and enlarged ends. It is not clear which of these was used for the tensile tests at room temperature.

It is well known that values for tensile properties can be and frequently are markedly influenced by the size of the test specimens. For this reason the dimensions of the test specimens for each type of application should approximate those of the service member as closely as possible. It is obviously unsound to compare the properties of one type of metal tested in one size with those of another type of metal tested in a different size. It would appear that the small rod used in the tests of the gold alloys is much more nearly representative of the clasps

and bars of a cast partial denture than is the large diameter specimen used for the cobalt-chromium alloys. In any case, it should be obvious that the .25 inch diameter specimen is easier to cast than the long thin rod used for the gold alloys. For this reason it would be expected that the large diameter specimen would be sounder and would yield higher tensile properties. Nevertheless, the highest tensile strength for any cobalt-chromium casting in the "as cast" condition, as reported in the author's Table 7 is 120,000 p. s. i., while the strength of the gold alloys ranges up to 130,000 p. s. i.

On page 430 Mr. Lane states that the composition and properties of four commercial (cobalt-chromium) alloys are shown in his Table 5, page 431, and the references cited indicate that these data were taken from a paper by Paffenbarger, Caul and Dickson. Unfortunately, the author's Table 5 omits properties and gives only chemical composition. Since the tensile properties of the cast cobalt-chromium alloys reported by Paffenbarger, Caul and Dickson were determined on cast specimens .075 inch to .095 inch in diameter and 4½ inches to 6 inches long, they are more nearly comparable with the reported properties of the cast gold alloys. Reference to the original Paffenbarger, Caul and Dickson paper shows that the following values for tensile strength in the "as cast" condition were obtained: Vitallium, 97,000 p.s.i.; Ticonium, 73,000 p.s.i.; Lunarium, 69,000 p.s.i. The cited data clearly show that the gold alloys have greater strength than these chromium base alloys.

On page 430 the author, in naming the advantages of the cobalt-chromium base alloys over the precious metal alloys, states, "Gingivae and soft tissues of the mouth show a greater tolerance to them than to gold alloys." No data whatever are submitted in support of this statement, and it must be assumed to be merely the author's opinion.

On page 435, in reciting the advantages of swaged steel partial dentures over those made of gold alloys, the author states, "Scalding of tissue due to hot food or drink is less likely because of the higher specific heat and lower thermal conductivity (about one-ninth that of gold alloys)." Again this appears to be merely the author's unsupported opinion. It is difficult to see how scalding could be prevented by any type of partial denture since the tongue and much other soft tissue of the oral cavity could not be covered.

It is generally conceded that an advantage of a metal over a plastic denture, especially when it covers the palate, is that because of higher thermal conductivity the metal denture permits more rapid response of the covered tissue to the normal sensations caused by hot or cold food or drink, and this contributes to a more normal sensation of taste and flavor. The higher conductivity of gold, as compared with steel or the cobalt-chromium base alloys, appears to be an advantage in favor of gold.—*R. L. Coleman, Research Director, The J. M. Ney Co., Hartford, Conn.*

BOOK REVIEWS

The National Health Service Act in Great Britain: A Review of the First Year's Working. Editor, Sir Heneage Ogilvie, K.B.E., D.M., M.CH., F.R.C.S. and Robert M. Steicher, M.D. (Associate Editor in U.S.A.), 108 pages. Price $2. New York: The International Practitioner Co., 1949.

This issue of *The Practitioner* (Autumn 1949) is a compilation of a series of reviews of the first year's workings of the service "in the full knowledge that it is too early as yet to view the matter in true perspective to know how far the good is due to the Act or to the momentum of the tradition of British medicine, how far what is unsatisfactory is due to the time-lag inevitable in putting any new machinery into motion rather than to faults in the design of the machine itself."

The Practitioner is a publication which recognizes no politics and speaks for no group or organization and has attempted to review the first year of the National Health Service, and to produce a report wherein the writer would speak his mind with complete freedom "not by the desire to please friends or placate enemies and to escape the labels of traitor or reactionary." It gives a picture of the hospital patient, the private patient, the administration and finally the cost of the health service.

A factual survey of the dental experiences of the first year of the general dental service portrays the profession's fears for the future. While the present scheme was introduced against the advice of the profession, two things stand out in the first year's working of the general service. They are: (1) A larger number of the public have received dental care during this year as compared with any one year, and (2) a greater number of the dentists have earned much higher incomes during the year. These facts may lead one to believe that the dental service has been successful, however, most dentists fear the future because the tremendous demand for dental treatment has brought difficulties and restrictions.

The general practice may be divided into the industrial group, the mixed middle class group and the school dental service. The first group experienced many problems and the services it rendered were mainly extractions and replacements by dentures. This practitioner has twice been faced with changes in fees, additional restrictions in services and the discipline due to breach in regulations.

For the mixed middle class the difficulties have mounted. While they receive adequate fees for conservative treatment the amount of time necessary for approval by the Dental Estimate Board varies from two to three months. This practitioner must control the number of patients under treatment at any one time to give effective treatment.

It appears "that dentists are becoming aware of the dental treatment that the Board will approve without further question. There is great temptation to give up the struggle for the right to give their patients the treatment that they think best and to take the line of least resistance by estimating for treatment which they know will be approved immediately."

The third type of dental practitioner, school health service and services for prenatal mothers, is disappearing gradually. There has been a steady drift of dental practitioners from the school service to the general service, resulting in closing of a large number of school clinics. It can be seen, therefore, that the number one priority service, where dental services are needed most and will have the most lasting effect, is of necessity lost.

The dentist in England views his future with anxiety and concern because of insecurity. His services are rendered with an eye to the economic point of view rather than to the clinical point of view. It matters not how many people demand treatment, or how extensive the treatment, the cost to the nation must be kept within boundaries. This philosophy results into arbitrary alterations and rates of remuneration which of necessity leads to lowering of standards.

The result of the experiences in the first year lead one to fear that the service will deteriorate both in quality and in methods of treatment which will be permitted, with deplorable results to the dental health of the nation and to future generations of practitioners in the art and science of dentistry. This book is recommended to all. It is concise and very enlightening.—*Harry Strusser.*

A Text-book of Oral Pathology. By Thomas J. Hill, D.D.S. Fourth edition, thoroughly revised. 398 pages with 314 illustrations. Price $7.50. Philadelphia: Lea & Febiger, 1949.

It is a rare privilege to review a book which the reviewer would like to have written. The subject except where noted later is reliably and adequately covered; the illustrations are excellent, well chosen and reproduced with great fidelity on a good quality of paper.

There are 18 chapters in all: the first five include the introduction and the discussion of abnormalities; chapters six and seven deal with accretions, abrasion and erosion; 11 through 14, with diseases of the periodontium; chapter 15, prepared by Edward Reiter, is an excellent treatment of deep infections of dental origin; stomatitis is discussed in 16; in 17 is found a satisfactory coverage of the relationship of mouth infections to secondary foci of infection elsewhere, and the concluding chapter has to do with progressive tissue changes and tumors.

In so controversial a subject as dental caries, it is practically impossible to find complete agreement between any two persons in all phases of the subject and it should be noted that the author's description of the Fosdick test for caries activity is incomplete and seems to favor wrong deductions. This and the failure to cite Stephan's pertinent observations on the speed of carbohydrate degradation in the mouth seem to indicate that the author does not fully grasp the bearing of both the Fosdick and Stephan researches on the speed of the active phase of the carious process in the mouth, and its relative short duration separated by periods of inactivity often lengthy. Generally the discussions of the clinical phases and implications of tooth pulp hyperemia are excellent in this book, but discussion of this hyperemia as a pathologic process leaves something to be desired. It must be borne in mind that the word hyperemia is used in at least three senses: (a) as a name for a clinical entity, (b) as a term to denote physiological activity of the pulp circulation, and (c) as a name for a pathological derangement of the pulp circulation.

Figure 250 on page 312 would be much more useful if the legend and identifying numbers were correlated below the cut. Chapter 18, pages 365-389, seems short and not wholly proportioned to the importance of the subject. Specifically there is nothing about the mouth adenomas, the adenomatous type of machrocheilia, mixed cell tumors and metastatic tumors, especially metastatic tumors of the jaw bones.

There is a very desirable correlation of the content of this text to clinical practice and it is highly recommended both as a textbook for students and for use by clinicians.—*Edward H. Hatton.*

Der Werkstoff in der zahnaerztlichen Prothetik. (Materials in use in prosthetic dentistry.) By Dr. med. dent. Arthur Demisch. Second enlarged edition. 198 pages with 71 figures. Index. Bern: Hans Huber Verlag, 1948. Price SFR. 19.80.

This neat little volume was prepared under the auspices of the Swiss Dental Society. It supplies the theoretical basis for the many technical procedures employed by both dental technicians and dental students. The 28 bibliographic references deal exclusively with pertinent publications in the German language. This betrays, perhaps, a serious limitation in scope and information. The similar and well-known American textbook by E. W. Skinner (Saunders), for instance, apparently is unknown to the author. The text of the numerous chapters is concise and clearly written and the illustrations are of good quality. Some detailed information on the chemical characteristics and the preparation of methacrylates was obtained through the collaboration of a specialist, Max Haefels, Basel.

The specific chapters deal with gypsum (plaster), dentocoll, guttapercha, wax, metals, rubber (vulcanization) and various products of polymerization (synthetic resins). Fifty-nine pages are devoted to the metallurgy of gold, silver, platinum, nickel, copper, steel, and so forth. Brief chapters concern the preparation of artificial teeth, the various pigments and the natural forms of teeth. Several gysi-articulators also are described.

Although the information on basic materials definitely is not as complete as in Skinner's book, the volume here reviewed goes beyond the contents of the former in describing the construction of various prostheses such as lingual bars, saddles, clasps and precision attachments. Comparative weights and gages in English, U.S.A. and in continental measures are given in an appendix.—*A. A. Zimmermann.*

Operative Dental Surgery. By J. B. Parfitt, L.R.C.P., M.R.C.S., F.D.S.R.C.S. (Eng.) and W. E. Herbert, L.R.C.P., M.R.C.S., F.D.S.R.C.S. (Eng.). Sixth edition. 446 pages fine print, with 268 illustrations. Index. Price $8.50. Baltimore: The Williams and Wilkins Company, 1948.

A sincere attempt has been made in this book to cover all phases of general dentistry excepting the complete and partial denture prostheses, orthodontics and major oral surgery. The book is beautifully written and well organized, but small type, reprinted illustrations and some rather poor photography give it an old fashioned appearance.

Several chapters contain general discussions which exhibit an uncommon amount of good sense. In separate chapters the authors have seen fit to include physical and chemical properties of the various filling materials. Consequent observations of what may and what may not be expected from each material make these the most noteworthy sections in the book.

Cavity preparation, rubber dam application, and indeed most of the sections on technic are rather disappointing. Perhaps the poorest is the chapter on "Bridges" wherein the discussion concerning clinical indications for fixed partial denture treatment and the principles to do with retainer design do not appear to be in accord with procedures generally accepted in this country.—*John Sproule.*

Public Health in the World Today. Edited by James Stevens Simmons. First edition. 332 pages with illustrations. Price $5. Cambridge: Harvard University Press, 1949.

There are those who still believe that public health should be restricted to environmental hygiene and communicable disease control—that a sharp distinction exists between curative and preventive medicine. This belief does not merit critical comment, but the zeal with which it is supported in many quarters does not permit of its cavalier dismissal. The present volume, a collection of papers presented by distinguished guest speakers at the 1947-48 Forum sessions of the Harvard School of Public Health, disproves the accuracy of this limited view.

In the opinion of this reviewer, the major value of the book is to provide a dynamic view of the structure and function of public health in the world today. The greatly broadened horizons of public health are a direct creation of the notable success of our conventional program of the past. Most of the diseases which previously commanded our attention were diseases of infancy, youth, and early manhood. Today mortality from these diseases has been drastically reduced, with the result that more people pass to the older age groups. Accordingly, the significant problems become those of chronic and degenerative disease.

Perhaps the fullest measure of the maturity of current principles and practice of public health lies in the belief that health is more than a mere absence of disease and infirmity. The growing concern over the social milieu as a determinant of total health is but another aspect of this coming of age.

Even the casual reader will carry away the conclusion that public health in the world today is an immensely complex enterprise. Assuredly, this book will find a place in the working library of all those professionally concerned with public health and welfare.—*Samuel Herman.*

Complete Dental Review. A general review for the practicing dentist and dental student preparing for examinations. By Walter Neal Gallagher, D.D.S. 431 pages. Price $9.00. New York: Dental Items of Interest, 1948.

The purpose of this book is to offer a review course to practitioners and students, particularly those preparing for examinations, in the form of questions and answers.

Divided into seventeen chapters, sixteen of which cover such subjects as anatomy, histology, embryology, bacteriology and anesthesia, the book also contains a list of the dental schools in the United States, Canada, many countries in Europe and in South America. The list is quite lengthy and, if accurate, presents some information not readily available elsewhere. The names of the secretaries of the state boards of dental examiners also are given, as are the subjects included in the written and practical portions of the licensure examinations of each state. Such data must be verified frequently to be kept up to date.

A comprehensive and useful list of reference books is included but in some cases the books are old or the latest edition is not given.

The work of assembling the information in this book was done solely by the author. The compilation of this material was a tremendous

task and represents a sincere effort to make a worthwhile contribution to the reviews of dentistry.—*Josephine P. Hunt.*

Lippincott's Handbook of Dental Practice. Edited by Louis I. Grossman. First edition. 417 pages with 306 illustrations. Index. Price $12. Philadelphia: J. B. Lippincott Company, 1948.

The author has chosen to divide his subject into two parts. The first is entitled "Diagnosis and Treatment," the second, "Restorative Dentistry." Each of the 17 chapters has been prepared by an authority on the subject presented.

The subjects covered in Part I and the names of the authors are as follows: The Prevention of Dental Caries, Basil G. Bibby and Joseph F. Volker; Control of Dental Caries, Louis I. Grossman; Roentgenologic Interpretation, Edward C. Stafne; Orthodontics, Alan G. Brodie; Periodontics, Balint Orban; Endodontics, Louis I. Grossman; Diseases of the Mouth, Lester W. Burkett; Prescription Writing, Edward C. Dobbs; Anesthesia, W. Harry Archer and Exodontics, James R. Cameron and J. J. Stetzer, Jr.

The two timely chapters dealing with caries prevention and control provide an excellent summary of the information available in this field.

The other chapters in Part I maintain this high standard. Dr. Brodie's enlightening section on orthodontics is worthy of special note and the discussion of endodontics by the editor is likewise outstanding. In all, this first part is very much worth while.

The subjects covered in Part II and the names of the authors are as follows: Gold Inlay Restoration, Edward M. Grevatt and Howard K. Mathews; Amalgam and Silicate Restorations, Benjamin Kornfeld; Ceramic Restorations, Carlisle C. Bastian; Pedodontics, Charles A. Sweet; Crown and Bridge Restorations, Arthur O. Klaffenbach, and Partial Dentures and Complete Dentures, Vincent R. Trapozzano.

This section dealing with restorative dentistry also provides some highlights. Worthy of first mention is Dr. Klaffenbach's chapter on "Crown and Bridge Restorations." The sound principles and technics presented are bound to be both interesting and useful to the general practitioner. The chapters dealing with complete and partial dentures are well worth while as are those on pedodontics and ceramic restorations. The remaining chapters concerning gold inlay, amalgam and silicate restorations would not fare well under close examination. This is most unfortunate in view of the fact that the average general practitioner is vitally concerned with this phase of dentistry. Suffice it to say that many periodicals will provide sounder principles and better technics than are to be found in these chapters.—*K. N. Morrison.*

CASES AND COMMENTS

Transplantation. A Case Report. By Horace M. Miller, D.M.D., Professor of Exodontia, University of Oregon Dental School, Portland, Ore.

A continuous, progressive study of the transplantation of third molar teeth to first molar position, in the mouth of the same patient, is going on in the Department of Exodontia of the University of Oregon School of Dentistry. Case no. 1, taken from the work of Drs. Horace M. Miller, Samuel A. Brandon, William Davis and G. Eland, is interesting.

A boy, 13 years of age, came to the College Surgery, February 11, 1948, with a lower right first molar to be extracted because of carious exposure and pulpitis. Figure 1 shows the first molar and third molar before transplantation. After the first molar had been extracted, the socket was carefully prepared for the third molar toothbud so that the top of the crown would be as near below the top of the bony ridge as possible. The soft tissue was sutured over the crown of the transplanted tooth.

The second roentgenogram (Fig. 2), taken February 18, 1948, after extraction of the first molar, shows the position of the third molar now in the socket of the first molar. Note that there is no root development and just a suggestion of bifurcation. We have later found that teeth with better developed roots are more desirable for transplantations.

The third roentgenogram (Fig. 3), taken June 4, 1948, shows how the bone forming in the socket has pushed the toothbud up toward the occlusal plane. The root development is very weak, progressing extremely slowly. The crown has a good appearance in the mouth, is clean and firm and gives the patient no pain.

The fourth roentgenogram (Fig. 4), taken April 30, 1949, shows the crown being forced up into occlusion and the patient chewing on it. The crown is firm and the supporting and surrounding tissues look healthy and normal. A small alloy filling was placed in the occlusal surface.

Fig. 1.—February 11, 1948

Fig. 2.—February 18, 1948

Fig. 3.—June 4, 1948

Fig. 4.—April 30, 1949

On September 16, 1949, 19 months after transplantation, the tooth was firm and functioning, the tissues appeared normal and healthy, but there has been little or no root development.

This case was presented before the Oregon State Society of Oral Surgeons.—*809 Northeast Sixth Avenue.*

Absence of Buds for Nine Permanent Teeth: Report of a Case.

By Martin H. Berman, D.D.S., Floral Park, N. Y.

The patient, a white girl, 11 years of age, and of normal weight and height, was brought in for routine dental examination. Visual examination revealed an abundance of hopelessly decayed deciduous teeth, in addition to rampant caries involving the first permanent molars in the lower jaw.

The patient was one of fraternal twins the other of which was a boy. Childhood diseases included measles and chickenpox. The prenatal history of the mother contained no findings of significance.

Roentgenographic Findings.—Full mouth roentgenographic examination revealed the absence of a startling number of permanent buds (Fig. 1).

In the maxilla the teeth in position included the permanent central incisors, right permanent lateral incisor, right deciduous cuspid, first and second deciduous molars, and the right permanent molar. On the left side, the deciduous lateral incisor, cuspid, first and second deciduous molars, and the right first permanent molar were in position. There was no evidence of the right permanent cuspid, nor of the first and second bicuspids. On the left side, there was no evidence of the left lateral incisor, left cupsid, first and second bicuspids. In all a total of seven permanent teeth were found to be lacking in the maxilla.

In the mandible all the incisors were in position. On the right side, the deciduous cuspid had not exfoliated and was in position between the right lateral incisor and the permanent cuspid which was distal to it. The right first bicuspid was present in the jaw bone, and the second deciduous molar was present mesial to the first permanent molar which was in position. On the left side, the permanent cuspid was in its proper position. The deciduous first and second molars were still retained. Distal to these was the first permanent molar. Buds for both permanent second bicuspids were absent. In all, there were two permanent buds lacking in the mandible.

Comment.—This patient showed a lack of buds for nine permanent teeth. Although it is true that the absence of the second bicuspids in the lower jaw and the upper lateral incisors in the upper jaw is by no means uncommon, absence of the upper second bicuspids, first

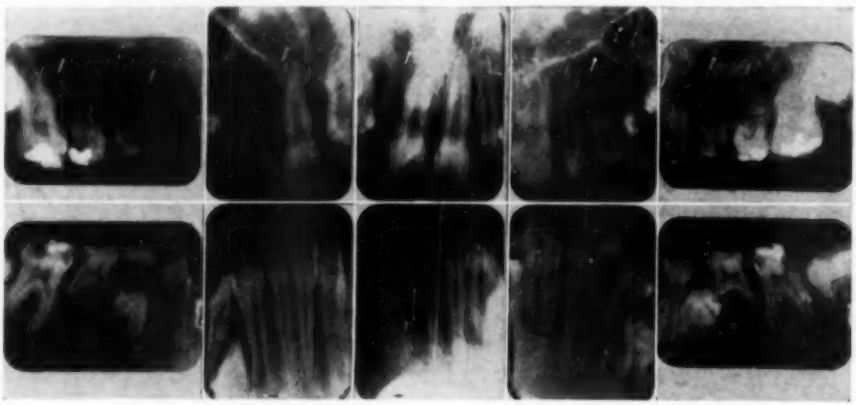


Fig. 1.—Note the absence of a number of permanent buds

bicuspids, and permanent cuspids is rarely encountered.

The fraternal twin to this female patient is a male and it is interesting to note that he has a normal number of deciduous and permanent teeth, with permanent replacements for all deciduous teeth. Without doubt, the hereditary influence in this instance is most significant. In the mother, the upper lateral incisors are lacking and, according to her recollection, a number of permanent teeth never erupted. Since she is edentulous in her posterior segments, it is impossible to verify her statement. Another daughter, 18 years of age, still retains an upper second deciduous molar, and also shows an absence of upper lateral incisors, as well as lower second bicuspids. Another son, age 21, possesses a normal dentition, with all deciduous teeth exfoliated and all permanent teeth erupted in proper relationship.

In view of the dominance of hereditary lack of a complement of permanent teeth in the female members in this family, it appears unlikely that this patient will ever possess a normal complement of permanent teeth.

An unfortunate phase of the case is the carious condition of the deciduous molars, many of which will have to be extracted.—*2 Whitney Avenue.*

Use of Chlorinated Cod Liver Oil Ointment in the Treatment of Infected Sockets. A Preliminary Report. By Daniel L. Hohman, D.D.S., B.S., Lt. Col. D. C. Res., Hagerstown, Md.

This report is made because the use of chlorinated cod liver oil ointment has been so successful in the treatment of stubborn, nonresponsive cases of infected sockets. It is recognized that the use of penicillin, as instituted and recommended by the military service during the war, is effective. However, certain patients object to additional injections and it is for them that successful medication is desirable in order to relieve pain and to promote healing.

This report is based on the use of chlorinated cod liver oil ointment since January 1949. The manufacturer of the product advised that there was no contraindication to its use except that the oily consistency would be objectionable insofar as retention in the oral cavity was concerned. In clinical experience the oil has been beneficial in preventing adherence to the tissues and permitting the dressing to be removed without mechanical irritation.

For three months this medication was used only in cases that did not immediately respond to the usual treatments as suggested by Thoma, Feldman, Krogh, Mead, Eman, and others. The results were approximately 60 per cent effective. Following this period, sterile sulfonamide powder (sulfanilamide and sulfathiazole, half and half) was added to the oil. The results were exceptional. Only one case failed to respond to treatment in 24 hours, and this case responded in 48 hours. All success or failure was based on clinical symptoms; namely, the success determined by the patient's report that pain had subsided and entirely disappeared.

The following method of treatment is suggested. The socket or sockets are first irrigated and any debris and foreign particles removed. A strip of sterile gauze, which will fill the cavity loosely, is impregnated with the chlorinated cod liver oil ointment and one side covered with the sulfonamide powder, only as much powder being used as will adhere to the gauze without pressure. It is recommended that the patient be checked every 48 hours, although some patients may be able to retain the dressing four or five days without pain or complications.—*314 North Potomac Street.*

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

THE PENMAN REPORT:

A BRITISH DENTAL TIME STUDY

THE full title of the Penman Report issued in August 1949 and reviewed here is "Report of the Working Party on the Chairside Times Taken in Carrying Out Treatment by General Dental Practitioners in England, Wales and Scotland." For convenience it will be referred to as the Penman Report for William Penman, the eminent actuary who was Chairman of the Working Party, which also included four dentists appointed by the three British dental associations. The Working Party was established by the Minister of Health, Aneurin Bevan, for the purpose of developing a sounder basis for remuneration of dentists under the National Health Service.

From the lists of dentists undertaking General Dental Services under the National Health Service in England, Scotland and Wales (hereinafter called Service dentists), 5 per cent of the names were chosen randomly, resulting in a sample of 505 dentists.[1] Fifty-two names were similarly chosen from a list of dentists not under the National Health Service, supplied by the British Dental Association. Another sample, not random, was made up of an unspecified number of dentists employed in dental practices of the "clinic" type.

All of these dentists were sent identical time sheets on which they were asked to record the dental operations performed during the week April 4 through April 9, 1949, the time each patient sat in the chair and left the chair, and other pertinent information. The dentists were invited to add their comments on any aspects of their work. Those who did not return completed time sheets were asked to submit the reasons why they could not, or would not, cooperate.

Of the 505 Service dentists, 52 per cent returned completed time sheets, a very high proportion in comparison with most mail surveys. Returns were received from 16 of the 52 dentists not under the National Health Service (31 per cent) and from 52 dentists employed in clinics of companies and government services.

The Spens Report, on which remuneration of Service dentists was originally based, set up a standard of 33 chairside hours per week. The Penman Report indicated that 64 per cent of the Service dentists were working on the average 25 per cent longer than the Spens standard. "Most dentists are working longer hours than is comfortable, or than would be good for them if continued for too long a period, and many of them are working more quickly than they would normally. These conditions have been forced upon them by the influx of work which has resulted from the expanded Health Service." Only 25 per

1. The mechanics of the random process are not given in detail beyond the statement that the names were drawn "by ballot"; the sample is referred to as random and this will be assumed to be correct.

cent were working shorter hours than the Spens standard, and among these were old men, convalescents, and so forth, who could logically have been excluded in the tabulations. This would have resulted in an even greater preponderance of dentists exceeding the 33 hour standard. Nine per cent were judged to be working at about standard.

More than half of the Service dentists volunteered comments, and these "leave a general impression of rush and strain, arising from the attempt to cope with the abnormally great demand for dental services which the National Health Service Act has evoked." Twelve per cent of the Service dentists stated they were returning their time sheets uncompleted because of ill health, which supports the conclusion that overwork is common.

Private practitioners averaged 19 sittings per day against 20 for Service dentists. The fact that private practitioners work about as hard as Service dentists does not necessarily refute the claim that the National Health Service has resulted in overwork for its member dentists. The proportion of patients who prefer dental care through private channels may be greater than the proportion of dentists remaining to give such care.

Service dentists on the average required 4.52 sittings per set of full upper and lower dentures, at 16 minutes per sitting. There were 16 dentists among this group whose time per sitting in the provision of full upper and lower dentures was nine minutes or less, and these averaged only 4.00 sittings per operation.

It was found that the average amount of "unidentified" time, or time between patients, was approximately three and three-fourths minutes. The Penman Report emphasized that this time was in no sense wasted and that it could not well be reduced.

An effort has been made to abstract the most significant information from several tables of the Penman Report for presentation in the table accompanying this review. The average number of sittings per operation can be derived separately for the various operations and for Service dentists and private practitioners. An interesting comparison is between the percentages for any given operation performed by the two groups of dentists. For example, private practitioners performed proportionately more restorations and fewer extractions and dentures than did Service dentists.

No tests of statistical significance are presented in the Penman Report. It is true that such tests are strictly valid only when the sample is random. Although the names of dentists may have been drawn randomly, a selective process is certain to have operated to determine which of the dentists returned completed questionnaires. That is, the 16 out of 52 private practitioners who responded may have been the busier ones, or the less busy ones, or the ones with assistants, and so forth. It is almost inconceivable that the respondents are as representative as would be a random sample. This is an inherent disadvantage of the mail survey method of gathering information.

In the absence of a random net sample, accuracy of results could have been improved by weighting. Only 37 per cent of the "Dentists 1921" in the sample responded, whereas 61 per cent of the "Licentiates" returned completed schedules. This obviously resulted in a bias—one which could have been rectified by weighting. For example, it would seem reasonable to expect that the "Dentists 1921," being older, would not be so quick or so energetic as the other group. Since they are under-represented, the average times for the dental operations are probably too short in the Penman Report. It is probable that an analysis of the proportion of returns from metropolitan and outlying areas would have given another opportunity for correcting results by weighting.

The Spens Report recommended that a dentist should receive a net income of

Number of sittings, operations completed and time required for dental operations in Great Britain, 1949

Operation	National Health Service				Private patients of National Health Service Dentists				Private practitioners			
	Total no. of sittings	Completed operations	Per cent completed operations	Average* minutes per operation	Total no. of sittings	Completed operations	Per cent completed operations	Average* minutes per operation	Total no. of sittings	Completed operations	Per cent completed operations	Average* minutes per operation
Examination	3,592	3,357	19.5	13	87	69	8.7	16	210	182	17.7	11
Scaling	1,407	1,220	7.1	25	48	37	4.7	30	121	105	10.2	25
Fillings	6,557	5,278	30.7	28	153	110	13.9	34	479	390	38.0	25
Conservations, deciduous teeth	259	208	1.2	16	12	10	1.3	23	21	16	1.6	21
Root treatments	241	34	.2	143	23	2	.3	246	26	9	.9	72
Extractions												
Local anesthetic	2,867	2,857	16.6	17	255	254	32.1	16	65	50	4.9	24
General anesthetic	1,158	1,152	6.7	18	82	82	10.4	15	58	45	4.4	20
Dentures (nonmetallic)	7,775	1,854	10.8	65	247	69	8.7	56	234	58	5.7	64
Relining	42	12	.1	51	6	4	.5	14	2	—	—	?
Repairs	348	186	1.1	16	65	34	4.3	18	27	14	1.4	16
Apicectomy	3	2	.0	52	1	1	.1	45	1	1	.1	61
Gingivectomy	15	2	.0	178	—	—	—	—	7	1	.1	160
Gum treatment	49	4	.0	186	2	—	—	?	8	2	.2	68
Alveolectomy	1	—	—	?	—	—	—	—	—	—	—	—
Radiographs†	225	203	1.2	11	29	26	3.3	14	68	63	6.1	11
Obturators	1	—	—	?	—	—	—	—	—	—	—	—
Orthodontics	148	8	.0	265	43	5	.6	118	113	9	.9	192
Special appliances	2	—	—	?	—	—	—	—	2	—	—	?
Impacted teeth, etc.	41	32	.2	41	4	2	.3	67	7	4	.4	65
Backing and tagging	—	—	—	—	—	—	—	—	—	—	—	—
Sensitive cementum	57	43	.3	12	3	1	.1	35	10	7	.7	13
Hemorrhage	38	24	.1	32	1	1	.1	9	—	—	—	—
Domiciliary visits	30	18	.1	64	2	1	.1	89	5	2	.2	117
Treatments not otherwise coded	1,566	602	3.5	34	123	56	7.1	34	150	34	3.3	56
Metal dentures	15	7	.0	37	12	6	.8	30	18	5	.5	76
Metal dentures, repairs	1	—	—	?	—	—	—	—	2	1	.1	10
Gold fillings	1	—	—	?	—	—	—	—	—	—	—	—
Inlays	127	46	.3	91	32	14	1.8	75	48	21	2.0	69
Crowning	94	41	.2	74	37	7	.9	140	10	6	.6	66
Total	26,660	17,190	100.	26.5	1,267	791	100.	27.9	1,692	1,025	100.	28.3

*Does not include time between sittings, which averages three and three-fourths minutes.
†Does not allow time for interpretation and report.
Source: Tables A, B and C of the Penman Report.

£1,600[2] per year in terms of the 1939 value of money. Considering inflation and an estimated 52 per cent operating cost, this resulted in a recommendation for about £4.000 gross income in 1948.[3] Time required for various dental operations was estimated and standard fees were established.

2. The pound sterling was worth $4.03 until September 18, 1949, when it was devalued to $2.80. There are 20 shillings to a pound and 12 pence to a shilling.

3. Gullett, D. W., A Lesson From Overseas. *J.A.D.A.* 38:523 (April) 1949 (Supplement).

The Minister of Health subsequently decided that fees were too high and in two arbitrary actions pared the incomes of dentists. Effective February 1, 1949, that part of each dentist's income which exceeded £4,800 was cut by half. However, Mr. Bevan still felt that dentists were enjoying excessive remuneration, and that to wait for the Penman Report would result in an unjustifiable drain on the Exchequer. Therefore, on June 1 a new set of fees, averaging about 20 per cent lower than the original fees, became law, and the February limitation was rescinded.[4]

Some of the fees are variable and are determined for individual cases by the Dental Estimates Board. Therefore, it is not possible to arrive at the exact gross income of the average Service dentist on the basis of the Penman Report. Suppose a dentist spent 12 per cent of his time on clinical examinations and reports, 41 per cent on multisurface fillings, 13 per cent on extractions of one or two teeth, 34 per cent on full upper and lower dentures and performed no other dental operations.[5] Suppose, further, that this dentist performed these operations in average time, as indicated in the Penman Report, plus three and three-fourths minutes between operations and worked 33 chairside hours per week for 46 weeks a year. This hypothetical dentist would annually gross about £4,800 under the new fee schedule and about £5,750 under the old. The 64 per cent who averaged 25 per cent more hours than the Spens standard would average an annual gross income of about £6,000 now and about £7,200 formerly. If a dentist spent only 25 per cent of his time providing sets of full upper and lower dentures, and spent proportionately more time on the other three operations noted, his gross income would be reduced by 14 per cent. Gross income is affected greatly by the amount of denture work, for which the fee-time ratio (and overhead) is high.—*B. Duane Moen, Assistant Director.*

4. For new and old fee schedules, see *J.A.D.A.* 39: 85 (July) 1949.

5. These percentages were derived from the total number of minutes spent in these operations by Service dentists who returned completed time sheets.

COUNCIL ON DENTAL RESEARCH

STATEMENT ON DIRECT RESINOUS FILLING MATERIALS

The Council on Dental Research is receiving a large number of inquiries regarding the merits and faults of the many direct resinous filling materials that are now appearing on the market. Pending the outcome of investigations now in progress in the cooperative dental research program between the federal government and the American Dental Association at the National Bureau of Standards the Council's advice is to use the materials for the types of cavities commonly suitable for silicate cement. This advice is based upon the known characteristics of methyl methacrylate resin together with preliminary experience in testing them clinically and in the laboratory. All users are urged to follow precisely the directions of the manufacturer of the product in use.—*Secretary.*

COUNCIL ON LEGISLATION

DIGEST OF STATE LAWS OF INTEREST TO DENTISTRY ENACTED AT SESSIONS HELD DURING 1949

THE Council on Legislation has prepared a digest of all bills of interest to dentistry which have been enacted into law during the 1949 legislative sessions. These are presented in THE JOURNAL in two parts. The first part which included the new Acts of all states from Alabama through Nevada was published in the January 1950 issue of THE JOURNAL. The second part which includes the new Acts of states from New Hampshire through Wisconsin is published below. States in which no laws of interest to dentistry were passed are listed at the end of the report. Inquiries, corrections or changes should be addressed to the Secretary of the Council on Legislation.

New Hampshire

Chapter 142, Laws 1949, Approved April 14, 1949.—Re-defines the practice of dentistry and dental hygiene. Spells out the use of titles and treatments which constitute the practice of dentistry. Exempts laboratory work done on the prescription of a licensed dentist, licensed physicians, and students at dental schools from the provisions of the Act. Permits dental hygienists to apply fluorine topically or to apply any of its compounds or other chemical compound which may be found to be effective and approved by the New Hampshire State Dental Board in preventing caries in human teeth. Amends the section relating to practice under a business name to read as follows:

No person shall operate any dental office under any name other than the name of the dentist or the dentists actually owning the practice. The provisions of this section shall not apply to any corporation which, upon the date of the passage of this Act, was operating a dental office under a corporate title containing the name of the dentist or dentists actually owning the practice so long as the corporate title shall continue to contain the name of the dentist or dentists from time to time actually owning the practice.

New Jersey

Chapter 52, Laws of 1949, Approved April 28, 1949.—Staggers the term of office of the Board of Trustees so that all terms expire on August 31 of the year in which the term is completed. Increases the application fee for licenses from $25 to $50 and the fee for subsequent examinations from $10 to $20.

Chapter 51, Laws of 1949, Approved April 28, 1949.—Increases the fee for examinations for dental hygienist to $20 for the first examination and $10 for each succeeding examination.

New York

Chapter 687, Laws of 1949, Approved April 18, 1949.—Corrects printer's errors in previous laws relating to the practice of dentistry or dental hygiene and makes other corrections to have said laws conform with other state statutes. Makes no substantive changes.

Chapter 442, Laws 1949, Approved April 6, 1949.—Amends the Education Law in relation to license to practice dentistry

so as to cancel the right to a New York license without examination of one "who holds a license to practice dentistry in any other state of the United States granted by a State Board of Dental Examiners, endorsed by the Dental Society of the State of New York."

North Carolina

Act of April 18, 1949.—Authorizes the North Carolina Medical Care Commission to establish regulations fixing fair and reasonable standards and plans whereby dentists and others receiving loans from such Commission shall receive credits on the principal and interest of such loans for each year or other period of time spent in the practice of his profession in a rural area.

Act of April 4, 1949. — Establishes a Board of Health for Guilford County and provides that one of its members shall be a dentist recommended by the Guilford County Dental Society.

Act of March 23, 1949.—Authorizes the Board of Trustees of the University of North Carolina to establish and maintain in conjunction with the medical school a school for the teaching of dentistry.

Act of February 28, 1949.—Makes it a misdemeanor punishable by fine or imprisonment for any person to violate the rules and regulations established by a District Health Department.

Ohio

Act of July 18, 1949.—Exempts dentists from jury duty.

Act of July 20, 1949.—Authorizes counties to be reimbursed for funds spent for dental care needed by a recipient of aid to the blind.

Oregon

Act of April 22, 1949.—Amends and revises the Dental Practice Act of the State of Oregon. Requires the Board of Dental Examiners to appoint a full-time executive secretary who shall not be a dentist. Apparently repeals the right to practice dentistry as a firm, association, or corporation. Establishes a standard fee of $50 for application for examination for dental license. Eliminates the list of specific subjects required for license. Permits a certificate of the National Board of Dental Examiners to be accepted in lieu of the written examination. Eliminates all requirements relating to the filing of license or certificate in the county in which practice is conducted. Increases the annual renewal fee for license from $5 to $7. Provides a fine of $250 for unlawful acts in violation of the Dental Practice Act. Adds to the list of unlawful acts the displaying of signs of former dentists. Requires certificates of license to be filed with the State Board of Dental Examiners. Provides fine of $250 for failure to do so.

Act of April 5, 1949.—Permits the practice of dental hygiene by a person who has successfully completed a course in an institution approved by the ADA and accepted by the Oregon State Board of Dental Examiners. Prohibits any person other than dentists or dental hygienists from removing deposits or accretions from the exposed surfaces of the human teeth of another person or cleaning or polishing such exposed surfaces, from applying and using within a patient's mouth such technical procedures, including the use of drugs approved by the ADA or the State Board of Dental Examiners, for the prevention of dental caries. Requires that work be done under the direction of a licensed dentist. Exempts physicians and students in a dental college from the provisions of the Act. Requires dental hygienists to pass an examination. They

must be 20 years of age, citizens of the United States, of good moral character, high school graduates, and have completed two years of work in an approved school. Examination fee is set at $15 and annual license fees at $5. Licenses must be displayed in the office of employment. Permits dental hygienists to be employed in public institutions or in the office of dentists, but they may not number more than the number of dentists in such office or institution. All work must be done under the supervision of a licensed dentist. Provides reasons for revocation or suspension of license and fines of $50 to $250 or imprisonment for violations of the Act.

Chapter 196, Laws of 1949, Approved March 19, 1949.—Requires practitioners of any of the healing arts to add after his name in connection with any written or printed matter, advertising billboards, signs, or professional notices, a designation in letters which shall be at least ¼ of the size of the largest letters used in the title or name. Requires dental practitioners to use the words "dentist" or "dental surgeon." Provides a fine of not more than $250 or imprisonment or not more than thirty days in the county jail for violations.

Chapter 124, Laws of 1949, Approved March 9, 1949.—Requires each licensed Board of the State of Oregon to file annually with the Secretary of the State a list of all persons licensed by such Board to practice a healing art together with the last known address of such person.

Pennsylvania

Act 106, Acts of 1949, Approved April 15, 1949.—Authorizes the Department of Public Instruction to secure an injunction against any person to restrain such person from practicing any profession without a license if a license is required to practice such profession.

Acts 378-379, Acts of 1949, Approved May 12, 1949.—Amend the laws relating to non-profit medical service corporations to permit the inclusion of dental services as a part of the services offered under such plan. Defines dental services to mean, "the general and usual services rendered by doctors of dental surgery serving in the capacity of staff members of accredited hospitals, provided such services are rendered in an accredited hospital."

Act 150, Acts of 1949, Approved April 20, 1949.—Permits dental hygienists to apply sodium fluoride.

Act 14, Acts of 1949, Approved March 10, 1949.—Revises the Pennsylvania School Laws. Requires dental examinations of all children of school age during the time they are members of the first, third, fifth, seventh, ninth, and eleventh grades by a dental examiner legally qualified to practice dentistry in Pennsylvania, who has been appointed by the Secretary of Health. Dental examinations may be made in health rooms, clinics, or rooms set aside for the purpose, that are equipped with the necessary facilities to insure privacy, adequate heat and light. Dental examinations shall include X-rays and other examinations that may be determined necessary. Permits dental examiners to be assisted by a registered nurse or dental hygienist. Requires a report including recommendations for dental care to be sent to each parent or guardian with instructions to consult the family dentist. Requires a complete and permanent medical and dental record to be established and maintained. Grants an option to children of school age to have examinations made by practitioners of their own choice at their own expense.

Rhode Island

Act of April 28, 1949.—Amends the Dental Practice Act to require that applicants

for license be graduates of a dental college of a standard recognized by the ADA and approved by the Board of Examiners in Dentistry. The Act formerly required that dental colleges be approved by the National Association of Dental Examiners.

South Dakota

Act of March 2, 1949.—Abolishes the State Department of Health and establishes the State Board of Health. Provides that one member of the Public Health Advisory Council shall be a dentist licensed to practice in South Dakota. Transfers to the State Department of Health all the powers, duties and rights of the State Board of Health, and continues in effect all existing rules and regulations.

Act of February 9, 1949. — Authorizes dental hygienists to apply such prophylactic or preventive measures as the application of chemicals to the teeth for the prevention of dental caries in the teeth when such measures are authorized by the State Board of Dental Examiners.

Tennessee

House Joint Resolution 6, Approved February 4, 1949.—Memorializes Congress to resist legislation setting up socialized medicine.

Texas

Senate Con. Resolution 58, Approved June 19, 1949.—Requests that members of Congress resist legislation setting up socialized medicine or compulsory health insurance.

Act of June 14, 1949.—Provides procedure for the revocation, cancellation, or suspension of dental licenses, and grants protection to the State Board of Dental Examiners of Texas in certain cases in relation to hearings concerning violations of the Dental Practice Act.

Utah

Act of March 17, 1949.—Provides for the licensing and registration of dental hygienists, defines the duties and powers of the Board of Dental Examiners, and fixes penalties for the violation of the Act. Permits any woman of good moral character, 19 years old or more, who is a citizen of the United States, and is a graduate of the school of dental hygienists recognized by the Department of Registration of the State of Utah, to apply for an examination. If licensed, a dental hygienist is authorized, in the office of a licensed dentist, in a dental college or dental hygienist school, to practice her profession under the supervision of a licensed dentist, and upon meeting the requirements of the Department of Education, to teach dental hygiene in the schools of Utah. Dental hygienists are authorized to remove calcific deposits or accretions from the surfaces of the human teeth outside of the normal attachment of the human gum tissue, but not beyond; to clean or polish teeth; to make instrumental examination of patient's teeth; to apply and use within the patient's mouth such therapeutic agents as her employer dentist may direct, and to engage in any of the practices within the oral cavity that are included in the curricula of recognized schools of dental hygiene. She is prohibited from performing any other dental operative procedure to the teeth or tissues of the human mouth.

Vermont

Act of May 11, 1949.—Creates a Depart ment of Health for the purpose of consolidating certain existing health and public health agencies. Provides for a commission of seven members, one of

whom shall be a licensed dentist in Vermont.

Act of April 28, 1949.—Establishes a school of dental hygiene in Vermont authorized to grant certificates of graduation upon completion of a two-year course. Provides special tuition rates for residents of the state as an incentive to practice dental hygiene in the state for a period of two years after graduation. Appropriates $25,000 for equipment, teaching and administration during 1949-1950 and $15,000 for the same purposes during 1950-1951.

Act of March 16, 1949.—Authorizes dental hygienists to apply topical sodium fluoride or other drugs for caries control.

Washington

Chapter 204, Laws of 1949, Approved March 19, 1949.—Makes it a misdemeanor and provides for the revocation or suspension of the license of any person engaged in certain professions, including dentistry, to pay or receive any rebate, refund, commission, unearned discount or profit in connection with referral of patients or in connection with the furnishing of dental care, diagnosis, treatment, or service.

West Virginia

Sen. Con. Res. 9, Adopted March 2, 1949.—Creates an interim committee of the Legislature to study and survey the advisability of establishing a four-year school of medicine and dentistry at the West Virginia University.

Act of March 10, 1949.—Authorizes the Bureau of Dental Health in the State Department of Health to establish a mobile dental health clinic to be financed solely from Federal Children's Bureau funds.

Act of February 28, 1949.—Creates a State Department of Health, including the Board of Health, one of whose members shall be a dentist licensed to practice in West Virginia and actively engaged in the practice of his profession.

Wisconsin

Chapter 415, Laws of 1949, Approved July 6, 1949.—Amends General Practice Act of the State of Wisconsin. Includes in the practice of dentistry one "who shall take or make or give assistance or provide facilities for the taking or making of any impression, bite, cast, or design preparatory to, or for the purpose of, or with a view to the making, producing, reproducing, constructing, fitting, furnishing, supplying, altering, or repairing any such prosthetic denture, bridge, or appliance." Revises the provisions with regard to reciprocity and fixes the fee for licensing at not less than $50. Increases the annual registration fee to not to exceed $4. Requires the published lists of dentists to be mailed to the Secretary of State, the District Attorney of each county, and other public officials. Requires registrants to notify the Board of any change of address. Provides a fee of $25 for registration if reinstatement is made or is not made within a period of one year from revocation. Authorizes the Board to suspend the license or certificate of a person who is a patient in a hospital for mental diseases. Increases the annual registration fee of dental hygienists to not more than $2. Fixes the reciprocity fee for dental hygienists at not less than $15. Permits reinstatement of dental hygenists who have failed to make their annual registration upon the payment of a fee of $5 if the license is reinstated within one year, otherwise the fee is fixed at $10.

There were no laws of interest to dentistry passed in these states: New Mexico, North Dakota, Oklahoma, South Carolina, Virginia and Wyoming.

COUNCIL ON DENTAL THERAPEUTICS

COUNCIL LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of *Accepted Dental Remedies:*

Anesthetics—Local[1]

Procaine HCl 4%, Neo-Synephrine HCl 1:2500-Superthesia Brand: Each cubic centimeter is stated to contain procaine HCl, 0.04 Gm.; phenylephrine HCl, 0.0004 Gm.; sodium bisulfite, 0.002 Gm.; in distilled water. Marketed in 2.15 cc. cartridges.

Manufactured by Proco-Sol Chemical Company, Philadelphia.

Procaine HCl 4%, Neo-Synephrine HCl 1:2500-Merit Brand: Composition: See Holtz Chemical Co., *A.D.R.*, ed. 15, p. 30.

Distributed by Merit Dental Company, Philadelphia.

Antibiotics[2]

Crystalline Penicillin G Procaine in Oil, 300,000 Units per cc. (With Aluminum Monostearate)-Merck: Each cubic centimeter of suspension is stated to contain penicillin G procaine, 300,000 units in peanut oil containing 2 per cent (w/v) aluminum monostearate. In 10 cc. vials.

Manufactured by Merck & Co., Inc., Rahway, New Jersey.

Admission to *Accepted Dental Remedies* means that the product was found to conform to the rules of the Council when it was accepted. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcomed.—*J. Roy Doty, Secretary.*

1. *A.D.R.*, ed. 15, p. 19.
2. *A.D.R.*, ed. 15, p. 39.

CURRENT LITERATURE

The Hypotheses Concerning the Etiology of Dental Caries. Gilbert J. Parfitt, Proc. Roy. Soc. of Med. Sect. of Odont. 42:393, June 1949.

The paper is a condensed treatment of the etiology of dental caries. The author takes up first: location of caries on tooth surfaces, stains, family incidence, age of susceptibility, international comparisons, institutional children compared to public school children, wartime and peacetime comparisons, and experimental results in biochemistry, bacteriology and histology. It is pointed out that the difficulty in forming a hypothesis suggests a diversity of factors involved in etiology.

Nutritional factors are discussed, including their influence on saliva. Work by Broderick and Hawkins on the relation of saliva to caries is discussed. The effect of diet upon tooth structure is discussed, and the work of Mellanby and King. Pre-eruptive care and the results of it are discussed, especially the work of K. U. Toverud and G. Toverud who reported caries reduction up to four years of age under a prescribed prenatal diet. Weaver's paper on the ingestion of fluorinated water is cited. A marked reduction in caries incidence was claimed, especially in primary dentition. Posteruptive and nutritional effects are discussed, and the work and opinions of Mellanby, Boyd and Drain.

On local factors in the mouth, such as type of food, mastication habits, shape of teeth, size of teeth and occlusion, the work of Wallace, Bibby and Price is referred to in a limited manner.

Miller's supposition of dental caries' two-stage process, acid decomposition followed by dissolution of softened tissue, is tested and questioned.

Refined carbohydrates as an influence upon dental caries even before Miller's time is aired and late work by Bunting and Jay is cited.

Work done on the bacteria of the mouth by Harrison, Burnett and Pincus is discussed.

The influence of protective surface membranes, cuticles, and pellicles from epithelial remnants is brought out. The protective action of a high fat diet as noted by Sim Wallace is considered.

Proteolysis is discussed at some length, including the work done and the hypotheses offered by Frisbie, Gottlieb, Pincus and Mathews. This latter discussion is well worth reading and contemplating. For a paper so condensed, it is exceedingly well done.—*Herbert W. Fleege.*

Conservative Surgical Treatment of Paradentosis—Gingival Reattachments. Pablo Facino. Rev. Circ. Odontolog. de Rosario. 19:130, July-September 1947.

Based on the Oestman technic modified by Norberg, a new method of treatment has been developed which starts with the occlusal adjustment, scaling, and rinsing of the mouth with an agent to reduce inflammation. Several days later, under infiltration anesthesia, every pocket is checked carefully to see that all the tartar has been removed from the cemental surface. Care is taken not to injure the soft side of the pocket. With a straight scalpel that has a very thin blade 1 mm. in width and 10 mm. in length, an incision is made in the interproximal space against the epithelium, with the scalpel cutting inside of the pocket and peeling out the epithelium vertically. A real vertical gingivectomy is accomplished parallel to the hard surface of the pocket until the next interproximate space is reached, and here it is continued until the median line of the last tooth is included. The epithelium from the gingival margin to the bottom of the pocket should be removed and the granulation tissue, leaving two surfaces inside the connective tissue that should be reattached to the cementum surface, and outside the oral epithelium.

In the lingual side the same operation is performed, or a horizontal gingivectomy can be performed with enough tissue to cover the bone crest and removal of the pocket epithelium of the remaining pocket. The bone tissue is cleaned of granulation tissue, but no bone is removed. The pocket is washed out with an antiseptic solution that is left in place in order to facilitate clotting. The wound is not satured and after the second or third day it is treated with the topical application of chromic acid or 20 to 40 per cent copper sulfate.

This technic is especially advisable in the anterior region for its esthetic results.—*Martin Cattoni.*

"Fluorine in Foods: Survey of Recent Data." F. J. McClure, Pub. Health Rep. 64:1061, August 26, 1949.

A survey of the fluorine content of foods, compiled from recent data, is presented for purposes of comparison and evaluation of the amount of fluorine ingested in the average human diet. Most foods in the average diet contain 0.2 to 0.3 ppm or less of fluorine, tea (75 to 100 ppm in dry tea) and seafoods (5 to 15 ppm) being notable exceptions. Fluorine in cow's milk (0.1 to 0.2 ppm) is not influenced by fluorine added to the cow's ration or drinking water. Soil and water fluorine content has no effect on the fluorine content of plant foods. However, those cooked in waters containing fluorine show an increased fluorine content as compared with those cooked in distilled water. The "natural" fluorine in foods appears to be largely available for body assimilation. Exclusive of drinking water, the average daily diet apparently provides 0.2 to 0.3 mg. fluorine. An additional 1.0 to 1.5 mg. fluorine would result from a total intake of 1,000 to 1,500 ml. water containing 1.0 ppm fluorine, the importance of such fluoridized water in preventive dentistry being widely recognized. The possibility of a dietary fluoride supplement in the absence of flurorine in drinking water is suggested.—*William Savchuck.*

Dietary Control of Dental Caries. Mario S. Cioffari. Arch. Pediat. 66:233, June 1944.

Two groups of 50 children each were observed regularly from birth until 5 years of age, as to their dental condition. One group had few sweets in their diet, with additional emphasis on coarseness of food, and on regular vitamin supplements. The control group had the average American diet with plenty of sweets and irregular vitamin supplements. Both groups used the same water supply. At 5 years of age, 78 per cent of the group under diet control had no visible cavities with 0.18 cavity per child, while only 6 per cent of the controls had no cavities with 5.22 cavities per child, a difference of 13 fold. The balance of evidence points to easily fermentable carbohydrates, especially sucrose, as the main offenders. A child's diet, at least until 7 or 8 years of age, should include (1) a bare minimum of sweets, (2) a good amount of coarse foods, and (3) a maintenance amount of vitamins. It might be advisable to give the unavoidable quota of sweets at the beginning of the meal only. Have a raw, coarse fruit or vegetable at the end, with raw fruit for snacks.

The physician who sees the child from birth on can exert the most influence, but physician or dentist can only advise; enforcement rests with parents.—*Sumter S. Arnim.*

A Rationale for the Treatment of the Intrabony Pocket; One Method of Treatment, Subgingival Curettage. Henry M. Goldman. J. Periodont. 3:83, July 1949.

The intrabony pocket is described as a distinct entity and successful treatment must be based, in part, upon an understanding of the tissue changes present. Local and systemic factors should be eliminated when recognized. Diagnostic criteria are presented for determining when therapy can be instituted with the expectation of achieving successful results.

Subgingival curettage is the therapeutic method of choice and is followed, in favorable cases, by tissue reattachment. The author states that reattachment is possible by means of new formation of bone and cementum, together with a regrowth of an organized periodontal membrane. Some causes of failure are listed as a guide for the proper selection of cases.

Data on six cases are presented to show the results achieved by subgingival curettage. On the basis of roentgenographic interpretation, the following terms are applied in describing the results brought about during the healing process: "new bone formation," 3 cases; "bone filling in," 1 case; "repair of bone," 2 cases; "deposition of bone," 1 case; "regeneration of lamina dura," 2 cases.

The word "reattachment" is not used in the report of any of the six cases. In two cases, probing would not allow entrance between gingiva and tooth after treatment and healing. In another case, gutta-percha could not penetrate the area where a pocket existed previously.—*Donovan W. Brown.*

Fabrication of Semicontoured Molar Loop Bands from Chrome Banding Material. E. E. Johns. Am. J. Orthodont. 35:651, September 1949.

The ease and accuracy with which molar loop bands are fitted are well known to all who have been using these bands. Since these bands have been made of precious metal, it is impossible to spot-weld stainless steel to them. Therefore, the following technic, using soft

chrome banding material, 0.006 or 0.005 inch thick by 0.18 inch wide, has been recommended.

There are five steps in the procedure:

1. Cutting the material into correct lengths.
2. Spot-welding into ring formation by lap joint.
3. Stretching the center of the band with the band stretchers.
4. Rolling the edges down with band stretchers and band rollers.
5. The formation of the loop at the lap joint.

Length of Material (millimeters)	Size of Band
35	no. 0. (for deciduous molars)
37	Small no. 1. (for permanent molars)
39	Medium no. 2. (for permanent molars)
42	Large no. 3. (for permanent molars)
44	Extra large no. 4. (for permanent molars)

William F. Ford.

Thumb and Finger Sucking By Children. Charles A. Sweet. Am. J. Orthodont. 34:1017, December 1948.

Nine ill effects of thumb- and finger-sucking are tabulated followed by a discussion of the results with special emphasis on those ensuing if the habit is allowed to progress beyond the first year of life.

Restraints of various types should be encouraged, but censoring, nagging, and shaming should be avoided. Early restraints as well as legitimate denials tend to build character in the child.

Head Growth of the Macaque Monkey as Revealed by Vital Staining, Embedding, and Undecalcified Sectioning. Alton Wallace Moore. Am. J. Orthodont. 35:654, September 1949.

The general conclusion that seems to be indicated by this study is that the connective tissue system, by its proliferation at certain sites, leads to the marginal growth of the bones. Some of these sites lead to enlargement and are located predominately in sutures. Other sites, some of which are sutural and others surface, act as adjustors by (1) maintaining contact of bones that would otherwise be separated or by (2) preventing the disproportionate enlargement of such cavities as the brain case, orbit, and nose.

A Summary of the Conclusions follows:

1. The specimen used for this study was a female Macaca rhesus monkey with a dental age comparable to a 5-year-old human being. It had been vitally stained with alizarin red S.

2. The universal occurrence of dye in the sutures was a strong indication that these structures, rather than the bones themselves, were primary agents of growth.

3. The generalized staining of the internal table of the cranium indicated that as the vault was increased in size by growth at the margins of the bones their thickness was increased by internal deposition.

4. The distribution of dye in the facial skeleton of the monkey, although very similar to that described by Brash for the pig, led to quite different conclusions than those reached by that investigator.

5. In the monkey the upper face grows in height primarily by an upward growth of the frontonasal process of the maxilla. A concomitant deposition of bone on the floors of the orbit and nasal cavity maintains their proportionality by preventing their enlargement.

6. Growth of the face in a forward direction was shown to be due to the backward growth of the tuberosity of the maxilla against a relatively fixed base, the pterygoid process of the sphenoid bone, resulting in a forward positioning of the maxilla. This mechanism seems to be common to swine, monkey, and man.

7. The posterior border of the horizontal process of the palatine bone maintains a relatively constant anteroposterior relationship to the nasal and oral pharynx during growth.—*William F. Ford.*

A Study of Bacterial Counts (Lactobacilli) in Saliva Related to Orthodontic Appliances. Olin W. Owen. Am. J. Orthondont. 35:672, September 1949.

The orthodontist is constantly being asked by the parents of prospective patients, "Will braces cause my child to have more cavities?" This question is easily answered by a defi-

nite "No." Braces do not cause cavities. But when the wording of the question is, "Will wearing braces increase the incidence of dental caries?" one immediately starts thinking of statistical evidence to verify his answer.

The lactobacillus count was used in this study and is the criterion in the tabulation of results.

The three main types of orthodontic appliances used on patients in this study are: (1) labial and lingual arch appliances; (2) angle edgewise appliance with modification, according to Tweed and Strang; (3) Johnson twin-wire appliance.

While the evidence for this series of cases is not conclusive, there is sufficient indication from other cases on which samples are being run that the following preliminary conclusions can be made:

1. The presence of orthondontic appliances in the mouth does increase the lactobacillus count.

2. The degree of increase is dependent somewhat upon the number of bands.

3. There is a correlation between the total band months and the number of lactobacilli per cubic centimeter.

It is definitely established that fewer carious dental cavities occur in persons with low lactobacillus counts, so that it becomes of utmost importance that the orthodontist carefully evaluate the present status of caries control. Among the hopeful procedures that should be made available to patients with orthodontic appliances are: (1) dietary control; (2) the use of fluorides in the communal water supply; (3) topical use of sodium fluoride; (4) ammonia preparations; and (5) salts of silver and other chemicals, as suggested by Gottlieb and others, for impregnation to protect the enamel from invasion of microorganisms.—*William F. Ford.*

Uses and Abuses of Penicillin. Paul A. Bunn, M.D. N. Y. State J. Med. 49:2059, Sept. 1, 1949.

Factors influencing the blood levels of penicillin are reviewed, and the therapeutic applications of penicillin in its soluble and relatively insoluble (procaine-penicillin) forms are discussed.

Intramuscular injections of 150,000 to 300,000 units of penicillin in aqueous solution twice daily are recommended for combating fusospirochetal infections of the pharynx and buccal mucosa, streptococcus sore throat, and similar infections by penicillin-susceptible organisms.

As a prophylactic measure against bacteremia following dental or other trauma, Dr. Bunn recommends intramuscular injections of 1 cc. of the more slowly excreted procaine-penicillin 24 hours prior to—and at daily intervals after—operative treatments. This regimen, while not absolute insurance against bacteremia, serves as a reasonable guard against serious complications, particularly in patients with rheumatic heart disease.

Caution is advised against the indiscriminate use of penicillin without prior identification of the responsible organism, and against the use of sub-effective concentrations and topical applications for reasons of economy, as well as therapeutic effectiveness, and possible interference with laboratory identification procedures.—*P. E. Tullar.*

The Relation of the Endocrines to Dental Development and Oral Health. Morton R. Lang. J. Canad. D. A. 15:480, September 1949.

In preparing this essay, the author states: "An attempt has been made to discuss the existing knowledge of the relation of the endocrines to dental development and oral health."

The essayist has adroitly presented the influence of hypofunction and hyperfunction of each of the endocrine glands on dental development and oral health, insofar as information permits. Also indicated are the restrictions and modifications the endocrinopathic patients require in dental practice.

In addition to specific statements of endocrine significance in the several areas of dental specialization, the value of this splendid organization of material to any and all dentists is best justified in the author's concluding remarks.

"The endocrine glands are of considerable importance to the dentist since they are intimately involved in the calcification of bones and teeth, in dental development and facial growth and may be aetiologic in certain cases of stomatitis, dental and periodontal disease. The dentist of today is a specialist in the healing art and the old concept of a dentist as a "tooth puller" or mechanic filling cavities or restoring lost teeth must be eliminated both in

the profession and among the public at large. While dentistry must hold fast to the accomplishments in the mechanical art and strive to improve existing techniques, the dental practitioner must assume the rightful title of specialist of the oral cavity. To assume and hold such a position the dentist must progress in the field of prevention. This can be accomplished only by further and more extensive biologic research and experimental study. The dentist must be the guardian of the hard and soft structures of the mouth. With a good knowledge of biological principles, an attitude that the oral cavity is part of the organism as a whole, and a keen eye, he can be a diagnostician who can detect an incipient disease state and advise the patient to seek medical treatment before it is too late. He must also recognize the futility of correction of a local abnormality without seeking and resolving that basic aetiological factor. But above all, he must look forward to the future with the hope that it will bring a wider use of the experimental method of research and a closer understanding between the experimenter and the clinician."—*S. C. Harris.*

Facts and Figures About Child Health in the United States. Katherine Bain and Harold C. Stuart. Am. J. Pub. Health and The Nation's Health. 39:1091, September 1949.

This study by the Academy of Pediatrics, concluded after three years, covered all physicians and dentists in private practice, all hospitals caring for children and many community health services.

In general its chief contribution is the documentation of earlier impressions. It turns opinions—that many children have inadequate medical care, that maldistribution of doctors and hospitals exists, and that many doctors who care for children are poorly trained—into facts which were anticipated.

The study showed that children in or near cities receive far more medical care then children living away from cities. In addition to the fact that there are not enough hospital beds for children, the study shows that much hospital care is of poor quality. The common beliefs that community health services fill the gap for those unable to obtain private medical care was shown to be groundless as only 1.7 per cent of the total volume of medical care rendered to children is given through community health services. A unique contribution in itself showed that dental care for children was far below medical care. The highest state dental value was 7.2 children per 1,000 under dental care in one day and the lowest was 0.9 children per 1,000. The highest state medical value was 21.9 children per 1,000 under medical care in one day and the lowest was 7.7 children per 1,000.

The inadequacy of child health services has been taken out of the area of controversy by this study and put in the realm of established fact. It has been hoped that this national report, published without recommendation, would stimulate the Committee for the Improvement of Child Health to take the leadership in the field of planning.—*Philip H. Suess.*

Differential Diagnosis of Oral Lesions. II. Malignancies of the Oral Regions. Bernier, J. L. Oral Surg., Oral Med., and Oral Path. 2:690, June 1949.

The oral cavity may be involved by malignant tumors whose correct diagnosis by laboratory or clinical means is of the utmost importance. Those of the epithelium may be basal cell carcinoma, squamous cell carcinoma, the adenocarcinoma or the transitional cell carcinoma; and those of the mesenchyme may be the fibrosarcoma, osteogenic sarcoma, chondrosarcoma, rhabdomyosarcoma, and the lymphoma. The latter group metastasize earlier and are less responsive to therapy.

The basal cell carcinoma, which arises from the basal layer of the epidermis or the epithelium of the skin appendages, is usually found on the upper portion of the face. On the basis of their characteristics clinically and histologically, these tumors are segregated into two groups: the Krompecher and the Brooke. These tumors, though erosive in nature, seldom metastasize and respond well to radiation.

The common sites of squamous cell carcinoma are the lips, cheeks, tongue, gingiva, palate, and the maxilla and mandible. On the lips, lesions may be of two types, papillary or ulcerating. The former appears as an increasing elevation while the latter spreads in all directions simultaneously. The tumor is more commonly found attacking the exposed surface of the lower lip of middle aged men. Those

carcinomas found on the cheek in the oral cavity may be irritated by operative and prosthetic appliances and may follow leukoplakia of long standing. Carcinomas of the tongue are more common in men and follow such conditions as chronic glossitis, leukoplakia, and ulcers of long standing, the sides of the tongue being the most common areas affected. Induration, generally with severe pain, is usually the first clinical symptom. Carcinomas are not usually found on the gingiva as the stratum corneum is better developed. The tumors of the hard palate may affect both the hard and soft palate and are nodular with raised indurated margins. Histologically the squamous cell carcinoma varies, but almost always chronic inflammation is found in association with the involved tissue. The production of keratin, the mitotic figures and the epithelial pearl are all of diagnostic significance.

The adenocarcinoma is essentially benign and uncommon in the oral cavity as a primary lesion. The tumor may be found arising from glands through the oral cavity, but more commonly it is found in the major salivary glands. The histologic picture varies greatly, but it is generally composed of epithelial cells of acinar configuration.

Transitional cell carcinomas arise from the respiratory epithelium and may invade the paranasal sinuses and maxillary antrum. Because of the inaccessible areas in which it may arise, it may be overlooked. Histologically the cells show a tendency to epithelioid differentiation but tend to retain their germinal character.

The pure intraoral fibrosarcoma, though rare, is usually associated with the periosteum or periodontal membrane. The prognosis is poor if the tumor has invaded bone though the tumors do not produce bone directly. Histologically they are made up of bundles of spindle cells with elongated hyperchromatic nuclei in which mitotic figures may be numerous.

A chondrosarcoma is a malignant tumor of cartilage and is more common in men. This tumor may grow on the surface of the bone and be of two types, either arising from the normal bone or being a malignant transformation of the benign bone.

The osteogenic sarcoma is not common in the maxilla and mandible. Though it exhibits a wide variety of histologic pictures, bone is usually found histologically in some portion of the tumor. The tumor may attack the bone in many different ways and may be very deceiving in roentgenographic diagnosis.

The rhabdomyosarcoma, a malignant tumor of striated muscle, is usually seen on the tongue and palate. Differentiation of the malignant and benign is difficult, and recurrence after surgical removal is common even though the tumors do not metastasize readily.

As the dentist is often responsible for detection of these lesions, he should understand their characteristics. Detection of these tumors at an early stage is of the utmost importance in control, and therefore the role of the dentist is obvious.—*Donald R. Kennedy.*

Principles and Technique of Exodontia. Frank W. Rounds. Oral Surg., Oral Med., & Oral Path. 2:705, June 1949. Information valuable to both general practioner and men planning to specialize in exodontia is offered in this paper. The requirements mentioned are adequate for the extraction of uncomplicated teeth.

Besides experience and good surgical judgment, proper equipment and its maintenance are essential for the successful completion of extractions. Washable equipment and removal of unnecessary accessories facilitate cleanliness. Great emphasis should be placed on thoroughly sterilizing all materials and instruments used in the operation to prevent surgical sepsis. The extent of sterilizing facilities depends on the individual's need. Apprehension about being hurt can be reduced by maintaining a cool operating room and concealing the operating instruments. General anesthesia requires a well-trained personnel, a capable anesthetist, and an assistant for the exodontist. During the operation, a headlight and motor-driven aspirator is indispensable in maintaining a clear operating field. A basic set of forceps aids materially the development of exondontic skill. Finally, a rest room is a necessary accessory for patients recovering from general anesthesia or from a difficult operation.

By following the above suggestions, maximum productivity and efficiency are attained by the exodontist and his personnel. The danger of office accidents and postoperative complications are also kept at a minimum.—*Joseph C. Tam.*

DEATHS

Appelbaum, Max, Paterson, N. J.; New York College of Dentistry, 1892; died November 14; aged 53.

Art, Rubin L., Chicago; Chicago College of Dental Surgery, 1924; died November 8; aged 46.

Bates, C. B., Downs, Kan.; died in May.

Baumgardner, Stanley L., Cleveland; School of Dentistry, Western Reserve University, 1917; died November 11; aged 58.

Best, Harrison D., Knox, Pa.; School of Dentistry, University of Pennsylvania, 1895; died November 15.

Bigler, Sidney H., Ashtabula, Ohio; School of Dentistry, Temple University, 1898; died October 26; aged 72.

Bond, Bruno, Chicago; Chicago College of Dental Surgery, 1916; died November 28, aged 57.

Brenton, Richard S., Pittston, Pa.; School of Dentistry, University of Pennsylvania, 1902; died November 1; aged 70.

Brosnihan, Fred H., Chicago; Dental School, Northwestern University, 1904; died November 10; aged 71.

Brown, Fred C., St. Paul; Louisville College of Dentistry of Centre College, 1903; died October 31; aged 70.

Buchanan, Benjamin K., Grove City, Pa.; School of Dentistry, University of Pittsburgh, 1914; died October 25; aged 61.

Butler, Edward E., Bowling Green, Va.; died September 26; aged 94.

Byrd, James S., Edgefield, S. C.; Atlanta Dental College, 1905; died November 13; aged 68.

Carpenter, Walter C., Meadville, Pa.; School of Dentistry, University of Pennsylvania, 1900; died November 25; aged 76.

Clark, Arthur G., St. Louis; School of Dentistry, St. Louis University, 1919; died November 5; aged 63.

Cohn, Charles, New York; School of Dentistry, University of Buffalo, 1916; died November 21; aged 64.

Combs, Marvin B., San Marcos, Texas; St. Louis Dental College, 1905; died September 27; aged 67.

Conover, Claude A., Newburgh, N. Y.; Philadelphia Dental College, 1890; died November 23; aged 79.

Dagen, Arthur J., Rochester, N. Y.; School of Dentistry, University of Buffalo, 1919; died October 29; aged 58.

Dashowitz, Max, Brooklyn; New York College of Dentistry, 1916; died November 1; aged 55.

Davidson, Ralph E., Burgettstown, Pa.; School of Dentistry, University of Pittsburgh, 1922; died August 8; aged 50.

Davis, Loyd, Centerville, Iowa; Kansas City Dental College, 1899; died November 20; aged 73.

Felice, T. James, Philadelphia; School of Dentistry, Temple University, 1937; died November 25; aged 36.

Finklea, Jesse W., Florence, S. C.; School of Dentistry, St. Louis University, 1905; died November 11; aged 73.

Forestner, John J., Sarasota, Fla.; Louisville College of Dentistry of Centre College, 1905; died November 3; aged 69.

Fortuin, William A., Grand Rapids, Mich.; Chicago College of Dental Surgery, 1888; died November 14; aged 88.

Gabbert, Roy D., Louisville, Ky.; School of Dentistry, Vanderbilt University, 1908; died November 16; aged 65.

Goodman, Charles E., Greenup, Ill.; School of Dentistry, Indiana University, 1919; died November 16; aged 53.

Gouse, Melvin H., West Palm Beach, Fla.; Chicago College of Dental Surgery, 1918; died November 12; aged 54.

Graham, Earl E., Van Nuys, Calif.; College of Dentistry, University of Southern California, 1919; died February 19; aged 54.

Graham, Glenn A., Lapeer, Mich.; College of Dental Surgery, University of Michigan, 1917; died September 24; aged 57.

Halferty, Fred, Lancaster, Wis.; died October 19; aged 80.

Hamilton, John L., Chester, S. C.; Southern Dental College, 1903; died October 10; aged 69.

Hamisfar, Morton D., Warrensburg, Mo.; Western Dental College, 1896; died October 16; aged 86.

Hanratty, James E., Butte, Mont.; School of Dentistry, North Pacific College of Oregon, 1922; died October 9; aged 51.

Harris, Edwin L., Clinton, Mass.; Baltimore College of Dental Surgery, University of Maryland, 1924; died September 25; aged 86.

Haynes, J. Chester, Montclair, N. J.; Dental School, Harvard University, 1904; died October 4; aged 67.

Hawkins, George E., Chicago; Chicago College of Dental Surgery, 1891; died November 15; aged 86.

Heaton, Foster M., Kansas City, Mo.; Kansas City Dental College, 1915; died November 15; aged 69.

Hebert, Octave N., Cohoes, N. Y.; School of Dentistry, University of Pennsylvania, 1910; died November 2.

Hendrick, J. Hart, Morrison, Ill.; Dental School, Northwestern University, 1920; died in December; aged 56.

Hockler, Maurice H.; New York; College of Dentistry, New York University, 1927; died November 19; aged 45.

Hodson, John W., Youngstown, Ohio; Chicago College of Dental Surgery, 1900; died November 8; aged 86.

Hogan, William J., Chicago; College of Dentistry, University of Illinois, 1932; died October 27; aged 42.

Holdener, Vincent C., Millstadt, Ill.; School of Dentistry, St. Louis University, 1934; died October 19; aged 39.

Holland, Houston G., Miami, Fla.; Southern Dental College, 1916; died November 12; aged 54.

Hopkins, Mortimer V., Detroit; Pennsylvania College of Dental Surgery, 1890; died October 17; aged 86.

Howe, Frank M., New York; School of Dentistry, University of Buffalo, 1904; died October 20; aged 67.

Howie, William P.; Indianapolis; School of Dentistry, Indiana University, 1897; died November 8; aged 81.

Hughes, George A., Guthrie, Okla.; School of Dentistry, Vanderbilt University, 1893; died September 25; aged 72.

Hunter, Alexander J., Bala-Cynwyd, Pa.; Medico Chirurgical College of Philadelphia, 1914; died November 13; aged 69.

Hutchins, John H., Detroit; College of Dental Surgery, University of Michigan, 1922; died September 26; aged 66.

Jaffe, Sidney, Philadelphia; School of Dentistry, Temple University, 1928; died June 6; aged 42.

Johnson, Walter E., Paducah, Ky.; School of Dentistry, University of Louisville, 1909; died October 16; aged 63.

Joliffe, Arthur V., San Diego, Calif.; Philadelphia Dental College, 1899; died October 22; aged 74.

Kaplan, Paul, New York; College of Dental and Oral Surgery, 1919; died October 3; aged 67.

Kennedy, John L., Las Cruces, N. M.; College of Dentistry, Baylor University, 1929; died September 25; aged 45.

Kettles, John F., Harvey, Ill.; Dental School, Northwestern University, 1903; died November 11; aged 70.

Knapp, Louis O., Youngstown, Ohio; School of Dentistry, Western Reserve University, 1917; died September 22; aged 55.

Koppel, Samuel, Milwaukee; Dental School, Marquette University, 1922; died September 28; aged 49.

Laffitte, Herman J., Fergus Falls, Minn.; Dental School, Northwestern University, 1903; died September 17; aged 71.

Lakin, Charles A., Worcester, Mass.; Dental School, Harvard University, 1897; died October 12; aged 73.

Larkin, George, Newberg, Ore.; died October 11; aged 74.

Laub, William, Camden, N. J.; School of Dentistry, Temple University, 1917; died December 14.

Lavin, Norton, Philadelphia; died in September; aged 27.

Lee, Emerson J., Hartford, Conn.; School of Dentistry, University of Pennsylvania, 1910; died October 22; aged 61.

Levy, Richard W., Los Angeles; College of Dentistry, University of Southern California, 1925; died August 21; aged 56.

Levy, William H., San Francisco; College of Physicians & Surgeons, 1902; died November 5; aged 67.

Lewis, A. J., Dayton, Ohio; School of Dentistry, Indiana University, 1897; died December 15; aged 78.

Lewis, Walter E., Cleveland; died October 13; aged 80.

Lieberthal, Charles P., Los Angeles; Dental School, Northwestern University, 1906; died November 1; aged 66.

Linton, Charles C., Irvington, N. Y.; New York College of Dentistry, 1890; died November 3; aged 83.

Liscom, Jason L., Los Angeles; College of Dentistry, University of Illinois, 1923; died October 7; aged 48.

Lutton, William B., Roselle, N. J.; Philadelphia Dental College, 1906; died December 10; aged 68.

MacVane, William L., Portland Me.; Dental Department, College of Physicians and Surgeons, 1910; died November 5; aged 73.

Magnuson, J. E., Orion, Ill.; Chicago College of Dental Surgery, 1895; died November 2; aged 89.

Mandelstein, Michael R., South Fork, Pa.; School of Dentistry, University of Pittsburgh, 1912; died October 8; aged 59.

Mann, Elbert A., Portland, Ore.; died October 10; aged 82.

Manville, Harry H., New York; College of Dental and Oral Surgery, 1913; died December 9; aged 60.

Mason, G. Bartle, Utica, N. Y.; School of Dentistry, University of Pennsylvania, 1903; died November 3; aged 68.

Mayo, Ollie K., San Antonio, Texas; Texas Dental College, 1915; died in October.

McCormick, Dwight J., Madison, Ind.; School of Dentistry, Indiana University, 1924; died October 13; aged 51.

McEwen, Duncan W., Oak Park, Ill.; Chicago College of Dental Surgery, 1905; died October 19; aged 72.

McKim, Roswell L., Osceola Mills, Pa.; School of Dentistry, University of Pennsylvania, 1889; died November 3; aged 60.

McMillin, C. D., Greer, S. C.; Atlanta-Southern Dental College, 1933; died August 16; aged 43.

McKinstry, John J. Miami, Fla.; died September 15; aged 86.

Meaney, Philip T., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, 1913; died September 22; aged 64.

Meek, Minnie D., Eureka, Minn.; Ohio College of Dental Surgery, University of Cincinnati, 1902; died October 19; aged 83.

Meyer, Clarence A., Minneapolis; College of Dentistry, University of Minnesota, 1928; died October 11; aged 55.

Meyer, Raymond L., Fort Worth, Texas; College of Dentistry, Baylor University, 1921; died November 1; aged 61.

Middleton, James J., Dallas, Texas; School of Dentistry, Vanderbilt University, 1895; died September 30; aged 78.

Monks, Leon D., New Haven, Conn.; Ohio College of Dental Surgery, University of Cincinnati, 1892; died September 30; aged 85.

Montague, Theodore H., Blue Island, Ill.; Dental School, Northwestern University, 1898; died October 23; aged 80.

Moriarty, James T., Marlboro, Mass.; Boston Dental College, 1895; died October 4; aged 77.

Morrison, John H., Rensselaer, Ind.; Indiana Dental College, 1915; died November 20; aged 57.

Moss, Zachariah W., Dixon, Ill.; College of Dentistry, University of Tennessee, 1896; died September 23; aged 74.

Munger, L. W., Nogales, Ariz.; Chicago College of Dental Surgery, 1905; died October 1; aged 72.

Munier, Vincent M., New York; College of Dentistry, New York University, 1888; died November 3; aged 83.

Murray, Malcolm J., San Bernardino, Calif.; College of Dentistry, University of Southern California, 1928; died October 25; aged 46.

Naramore, Frank, Salt Lake City; School of Dentistry, University of Pennsylvania, 1891; died November 15; aged 84.

Neuenschwander, Harry W., Berne, Ind.; School of Dentistry, Indiana University, 1911; died September 24; aged 63.

Newton, George O., Hannibal, Mo.; Barnes Dental College, 1909; died October 4; aged 64.

Nice, Frank R., St. Petersburg, Fla.; died October 13; aged 85.

Nolan, Francis A., Erie, Pa.; School of Dentistry, University of Pittsburgh, 1929; died October 16; aged 44.

Northington, John G., Emporia, Kan.; School of Dentistry, Washington University, 1888; died September 18; aged 85.

Notz, Eberhard J. W., Milwaukee; Dental Department, Milwaukee Medical College, 1903; died October 6; aged 68.

Owings, Thomas, Montgomery City, Mo.; School of Dentistry, Washington University, 1895; died September 30; aged 79.

Oyler, Raymond G., Woodward, Okla.; College of Dentistry, University of Iowa, 1908; died September 19; aged 68.

Palmer, E. J., Armour, S. D.; Dental School, Northwestern University, 1918; died in October; aged 58.

Park, Ellsworth S., Jacksonville, Texas; Dental School, Northwestern University, 1906; died June 17; aged 71.

Parker, Henry R., New Bern, N. C.; Southern Dental College, 1898; died October 7; aged 76.

Parrish, Augustus R., Tacoma, Wash.; Marion Sims Dental College, 1899; died November 5; aged 76.

Payne, Percy P., Cambridge, Md., Baltimore College of Dental Surgery, University of Maryland, 1888; died November 13; aged 61.

Perkins, C. N., Oak Grove, Ore.; School of Dentistry, North Pacific College of Oregon, 1909; died October 30; aged 65.

Peterson, Carl E., Chicago; Chicago College of Dental Surgery, 1916; died October 15; aged 65.

Petrides, Menelaus B., New York; New York College of Dentistry, 1916; died October 12; aged 60.

Pfister, Joseph J., San Francisco; College of Dentistry, University of California, 1888; died October 14; aged 81.

Phelps, Charles J., Saginaw, Mich.; School of Dentistry, University of Pennsylvania, 1900; died August 13; aged 71.

Pitman, Harry A., Cherokee, Iowa; College of Dentistry, University of Southern California, 1908; died September 30; aged 74.

Pitts, Samuel H., Columbia, S. C.; School of Dentistry, Medical College of Virginia, 1941; died November 14; aged 35.

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 1-3	Biloxi, Miss.	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona	April 20-22	Grand Canyon	H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas	April 2-5	Little Rock	D. M. Hamm	White Bldg., Clarksville
California	April 24-26	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	April 3-5	Los Angeles	M. E. Ralston	Medico-Dental Bldg., Pomona
Colorado	Oct. 4-7	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut	May 22-24	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			Norbert Gladnick	1009 Madison St., Wilmington
D. of Columbia	Mar. 12-15	Washington	K. H. Wood	202-1835 Eye St., N. W., Washington
Florida			L. M. Schulstad	Professional Bldg., Bradenton
Georgia		Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 12-14	Honolulu	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho	June 26-28	McCall	A. R. Cutler	Eastman Bldg., Boise
Illinois	May 8-11	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 15-17	Indianapolis	E. E. Eubank	Kingman
Iowa	May 1-3	Des Moines	H. I. Wilson	639 Insurance Exchange, Des Moines
Kansas	May 7-10	Kansas City, Mo.	F. A. Richmond	1008 Huron Bldg. Kansas City
Kentucky	Mar. 29-31	Louisville	A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	April 13-15	Monroe	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 22-24	Belgrade Lakes	F. P. Gilley	31 Central St., Bangor
Maryland	May 1-3	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 1-4	Boston	A. M. Bommer	349 Broadway, Revere
Michigan	April 24-26	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 20-22	St. Paul	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 18-21	Biloxi	F. C. Sneed	Oxyka
Missouri	May 7-10	Kansas City	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 4-7	Helena	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 8-10	Omaha	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 8-9	Las Vegas	C. A. Paice	Boggs Bldg., Las Vegas
New Hampshire	June 18-20	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey	April 26-28	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 22-24	Albuquerque	J. S. Eilar	First National Bank Bldg., Albuquerque
New York	June 5-8	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 18-20	Pinehurst	R. F. Hunt	Rose Drug Co., Bldg., Rocky Mount
North Dakota	May 7-10	Fargo	A. L. Smeby	Northwood
Ohio	Nov. 27-29	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 16-19	Tulsa	F. H. Binkley	Hennessey
Oregon	Mar. 6-8	Portland	H. C. Fixott, Jr.	Medical Dental Bldg., Portland
Panama Canal Zone			R. O. Leon	Box 1094, Ancon
Pennsylvania	Oct. 28	Atlantic City, N. J.	M. B. Zimmerman	217 State St., Harrisburg
Puerto Rico			F. Guerra	Avenida Ponce de Leon, Santurce
Rhode Island			J. F. Colgan	838 Newport Ave., Pawtucket
South Carolina	May 7-9	Columbia	J. R. Owings	201 E. North St., Greenville
South Dakota	May 14-16	Huron	E. W. Elmen	Sioux Falls
Tennessee	May 10-12	Chattanooga	E. J. Justis	Exchange Bldg., Memphis
Texas	April 23-27	Dallas	W. Ogle	310 N. Ervay St., Dallas
Utah	May 15-17	Salt Lake City	B. F. McBride	Medical Arts Bldg., Salt Lake City
Vermont	May 22-24	Woodstock	J. A. Larrow	Middlebury
Virginia	April 17-19	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 22-24	Spokane	F. J. Dingler	1502 Medical-Dental Bldg., Seattle 1
West Virginia	May 15-17	Huntington	A. B. Drake	Huntington
Wisconsin	April 11-13	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 22-24	Cheyenne	T. A. Ward	326 Wyoming National Bank Bldg., Casper

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Arkansas	June 19-22*	Little Rock	H. E. Hanna Secy.	Wilson Bldg., El Dorado
California	June 12 July 24	Los Angeles San Francisco	K. I. Nesbitt	507 Polk St., San Francisco 2
Hawaii	Feb., 8-13*	Honolulu	H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Iowa	June 5-9	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Michigan	Jan. 29-Feb. 4 June 11-June 17	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
New Jersey	June 5-9† June 5-6‡		W. A. Wilson	150 E. State St., Trenton 8
Oregon	June 19-22*	Portland	A. F. Davis, Exec. Secy.	306 Public Service Bldg., Portland
Pennsylvania	June 19-24† June 19-22‡	Philadelphia and Pittsburgh	R. E. V. Miller	Northampton National Bank Bldg., Easton, Pa.
Virginia	June 13	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Wisconsin	June 12-16	Milwaukee	S. F. Donovan	Tomah

*Dentistry and dental hygiene.
†Dentistry.
‡Dental Hygiene.

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Academy of Denture Prosthetics	May 1-7	Milwaukee	L. L. Furnas Secy.	La Jolla, Calif.
Akron Dental Society, Tenth Annual Children's Dental Health Week	Feb. 6	Akron	H. L. Goldfarb Chm.	776 N. Main St., Akron, Ohio
American Academy of Dental Medicine, New York Section	Feb. 28	New York	Ruth Aron Editor, New York Chapter	57 W. 57th St., New York
American Association of Dental Schools	Mar. 27-31†	French Lick Springs, Ind.	J. E. Buhler Secy.	School of Dentistry, Emory University, Atlanta 3, Ga.
American Association of Endodontists, Annual Meeting	Feb. 4-5	Chicago	N. W. Burkman Secy.	525 Merrill St., Birmingham, Mich.
American Board of Oral Surgery	April 2-3	Chicago	L. M. FitzGerald Secy.	718 Roshek Bldg., Dubuque, Iowa
American Board of Orthodontics	May 4-7	Chicago	S. C. Hopkins Secy.	1726 Eye St., N. W., Washington, D. C.
American Board of Prosthodontics	Jan. 29-Feb. 4*		I. R. Hardy Secy.	Tufts Dental College, 136 Harrison Ave., Boston
American Dental Society of Europe	July 19-22	Amsterdam, Holland	F. D. Derrick	140 Park Lane, London, W. 1.
American Denture Society	Feb. 4-5	Chicago	S. W. Cotter Secy.	11059 Hale Ave., Chicago
American Society for the Advancement of General Anesthesia in Dentistry, Spring Meeting	Mar. 27	New York	M. H. Feldman Exec. Secy.	730 Fifth Ave., New York 19
California State Dental Association, First Annual Meeting, Children's Dental Health Conference	Feb. 6	San Francisco	L. W. Schmohl, Jr. Gen. Chm.	450 Sutter Bldg., San Francisco
Chicago Dental Society Midwinter Meeting	Feb. 6-9	Chicago	E. W. Baumann Secy.	30 N. Michigan Ave., Chicago

*Examinations for certification.
†General sessions March 27-29; research meetings March 29-31.

Name	Date	City	Secy. or Chm.	Address
Cleveland Dental Society, Tenth Annual Children's Dental Health Day Meeting	Feb. 6	Cleveland	L. Greulich Exec. Secy.	710 Carnegie Hall Bldg., Cleveland 15
District of Columbia Dental Society Annual Postgraduate Clinic	Mar. 12-15	Washington	A. A. Shapiro Promotion Chm.	1835 Eye St., N. W. Washington, D. C.
Greater Philadelphia Annual Meeting	Feb. 1-3	Philadelphia	R. Adams Secy.	710 W. York St., Philadelphia
National Board of Dental Examiners	April 10-11‡		G. L. Teall Secy.	Box 71 Hiawatha, Kan.
New York University College of Dentistry, Silver Anniversary	April 14	New York	Sidney Sorrin Chm.	New York University Alumni Office 22 Washington Square, North, New York 11
Northeastern Society of Orthodontists, Annual Meeting	Mar. 6-7 Nov. 6-7	Boston Washington, D. C.	O. Jacobson Secy.	35 W. 81st St., New York
Southeastern Society of Oral Surgeons, First Annual Meeting	Mar. 17-18	Atlanta, Ga.	G. W. Matthews Editor	1922 Tenth Ave., S. Birmingham, Ala.
Southwestern Society of Orthodontists	Feb. 12-15	Houston, Tex.	M. A. Flesher Secy.	Medical Arts Bldg., Oklahoma City
Temple Dental Alumni, Annual Meeting	May 9, 10	Philadelphia	A. L. Borish	255 S. 17th St., Philadelphia 3
Thomas P. Hinman Mid-Winter Clinic, Thirty-Eighth Annual Meeting	Mar. 19-22	Atlanta, Ga.	S. L. Davis Gen. Chm.	932 Candler Bldg., Atlanta, Ga.
University of Kansas City, School of Dentistry, Kansas City-Western Dental College, Alumni Annual Meeting	Mar. 20, 21	Kansas City, Mo.	H. H. Dukes Chm. Publicity Committee	New Brotherhood Bldg., Kansas City, Kan.
University of Toronto, Faculty of Dentistry, Continuation Course in Operative Dentistry	Feb. 13-17	Toronto	R. G. Ellis Dean	Faculty of Dentistry, University of Toronto, 230 College St., Toronto, Ontario, Canada
University of Toronto, Faculty of Dentistry, Continuation Course in Radiography for Graduates in Dentistry	Feb. 27-Mar. 3	Toronto	R. G. Ellis Dean	Faculty of Dentistry University of Toronto 230 College St., Toronto, Ontario, Canada

‡Part 1 and Part 2 in schools where there are five or more candidates.

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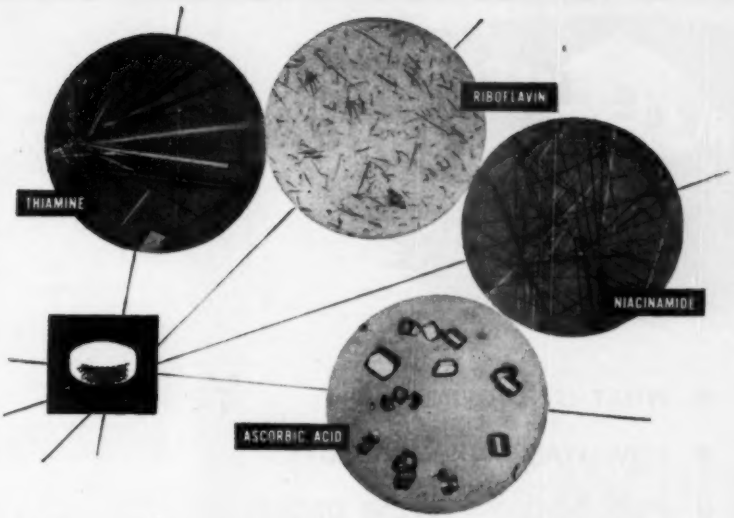

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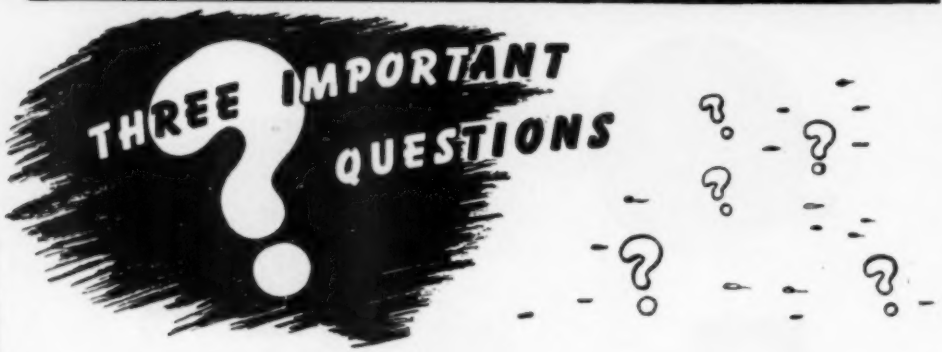

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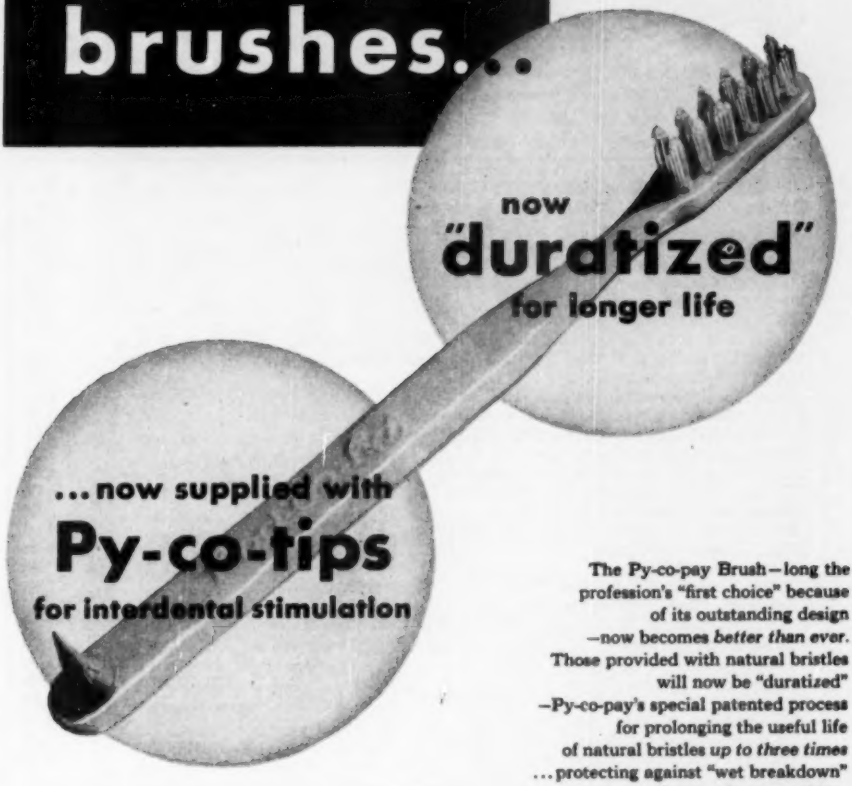

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The Py-co-pay Brush—long the profession's "first choice" because of its outstanding design —now becomes *better than ever.* Those provided with natural bristles will now be "duratized" —Py-co-pay's special patented process for prolonging the useful life of natural bristles *up to three times* ...protecting against "wet breakdown" ...preventing sagging or matting. "Duratizing" insures amazing "flexible stiffness" that means longer brush life...better tooth cleaning during the greater period of use. Also, every Py-co-pay Brush will now be supplied equipped with a Py-co-tip *interdental stimulator* affixed to the brush handle, ready for your patients' use according to your instructions. Thus, the name of Py-co-pay (Py-co-pay Brush, Py-co-pay Powder, Py-co-tip) continues to connote the ultimate in efficiency and safety in oral hygiene ...to merit more than ever your recommendation to your patients.

PYCOPÉ, INC.
2 High Street, Jersey City 6, N. J.

Py-co-pay
TOOTH BRUSHES and TOOTH POWDER

Prices Drastically Reduced!

FOR 30 DAYS ONLY! **ORDER AT ONCE**

Chrome-Plated **Contra Angle Doriot**

Made in U.S.A.

$6.95

Present selling price in Dental Depots $11.00 — ONLY ONE TO A CUSTOMER

☐	100 "STANDARD" Anesthetic TUBES—(Accepted A.D.A.) (Formulas 2A and 1AB)	$ 3.95
☐	Chrome Plated, U.S.A. Make, Right Angle for Doriot	5.85
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☐	Chrome Plated, U.S.A. Make, Doriot Hand Piece	18.45
☐	Diamond Instruments—Nos. 1-2-7-18-25-26-32-35-75-76-87 Each	1.95
☐	IMPORTED BURS Round or Inverted Cone Gross	7.00
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☐	IMPORTED FORCEPS (Chrome-Plated) Each (Numbers 15, 16, 18L, 18R, 32, 53L, 53R, 65, 69, 85, 88L, 88R, 150, 151)	2.45
☐	IMPORTED Collar & Crown Scissors (Chrome-Plated)	1.45
☐	IMPORTED Gum Scissors	1.95
☐	1 Gross Tooth Cleaning Brushes (Cup or Wheel)	5.95
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☐	12 GUARANTEED BOILABLE MIRRORS (Sizes 4-5-6 Plane or Mag.)	2.90
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☐	12 Carborundum Mounted Points (Assorted)	1.00
☐	2 Chrome Plated Clogless Saliva Ejectors	1.00
☐	2 Dozen Steel Disks (⅛"-¾"-⅞")	1.00
☐	1 Bottle Surface Anesthetic (A.D.A. Accepted)	1.00
☐	2 Ozs. Copper Amalgam	1.00
☐	6 Dozen Broaches	1.00
☐	200 No. 2 Record Cards, Size 4"x6"	1.00
☐	1 Amalgam Carrier (Chrome Plated)	1.00
☐	4 Stainless Steel P. W. Explorers (3-6-17-23)	1.00
☐	6 Boxes Celluloid Strips	1.00
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☐	50 Assorted Heatless Wheels (sizes 4 to 12)	1.00
☐	20 Books Articulating Paper	1.00

FREE—Modern Ball Point Pen—with $10.00 order—FREE!

HURRY If you want any of these SENSATIONAL VALUES
FILL IN AND MAIL AT ONCE—BEFORE IT IS TOO LATE

Please send me supplies marked with X

☐ Enclosed please find $_____ ☐ Send C.O.D. (C.O.D. Fees Extra)

Ship to Dr._____ Date_____

(Please print . . . or enclose card)

Address _____

City _____

STANDARD DENTAL PRODUCTS CO.

908 Chestnut St. **Philadelphia 7, Pa.**

ABSOLUTE SATISFACTION or YOUR MONEY BACK

Add 5 to 10 years

to your professional life . . . profitably . . . comfortably

with ROTA-SEAT

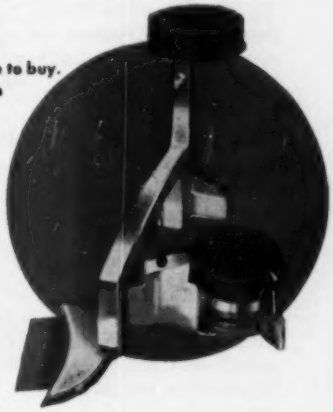
Rota-Seat gives you complete operating freedom—SITTING DOWN. It will add years, profitable years, to your professional career, because when you work sitting down you banish exhaustion, backache, bending and twisting stresses that can build up to serious organic disorders. You can take care of more patients, too, for you will need fewer rest periods.

Rota-Seat is a real operating seat, you sit on deep, foam rubber, and roll easily to any operating position. More and more dental colleges are endorsing Rota-Seat's "sit-down" technique every day —send for fully illustrated booklet showing how to combat fatigue and live longer—the Rota-Seat way.

Ask your dental supply dealer to show you how easy it is to operate from a Rota-Seat in *your* office. Thousands of satisfied users.

BASIC FEATURES:

- **Foot control switch ALWAYS moves when you do.**
- **Use your regular equipment—nothing else to buy.**
- **Rota-Seat is always there—it can't push away from the chair.**
- **Day long comfort—no lost motions —stand instantly when necessary.**
- **No change in your technique—no loss of leverage—you actually work closer to patient—your hands are always free.**
- **Feel better—work better—get new operating comfort with ROTA-SEAT.**
- **ROTA-SEAT is the ORIGINAL operating seat for dentists— (not merely a rest stool)**



rota-seat INC.

DENTAL EQUIPMENT SPECIALISTS

4606 W. 21st St. Cicero 50, Ill.

DEPTH WITHOUT DANGER

In an anesthetic *Safety* is the *First* consideration

MONÓCAINE

THE "SAFETY FIRST" LOCAL ANESTHETIC

To the Deep-Sea Diver, safety is more important than depth. Without his special depth-defying equipment "Depth without danger" would be impossible. In your anesthetic too, "Safety" must be your "First" consideration!

From Cocaine to Monócaine

COCAINE WAS an "efficient" anesthetic. It provided deep, powerful, long-lasting anesthesia. But the dental and medical professions discarded it because it provided depth without safety. Procaine replaced cocaine swiftly because of the safety factor. Now Monócaine is replacing Procaine.

WHILE SAFETY is the first consideration, the anesthetic must be potent enough to assure freedom from discomfort and pain. Monócaine is such a local anesthetic! Extensive clinical reports on Monócaine are available on request.

Monócaine is the registered trade mark of the Novocol Chemical Mfg. Co., Inc.

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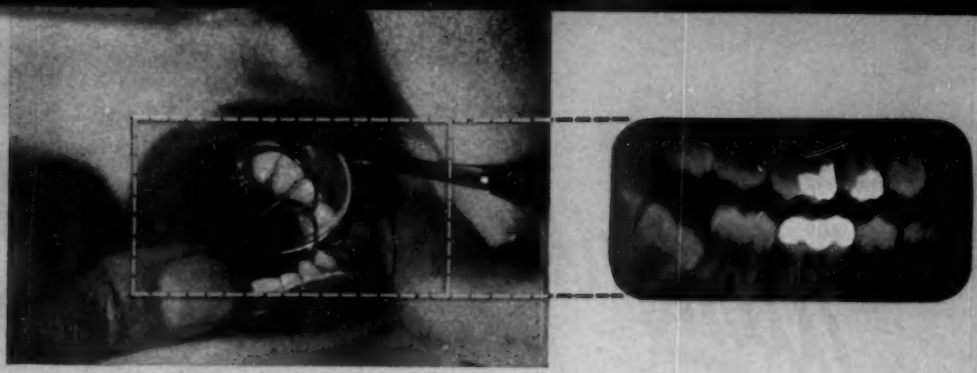
291-25 Atlantic Ave., Brooklyn 7, N.Y.



Locate up to 40% more cavities

MAKE COMPLETE BITE-WING EXAMINATIONS . . .

Twice a year for children **Once** a year for average adults

Never before have you had such a wide-open opportunity to promote your services. Right now dentifrice advertising is making people more and more "tooth-conscious." Make your patients more "x-ray-conscious" by giving them the 12-page booklet, "How to Prevent Toothache," by Howard R. Raper, D.D.S. (first 50, free—additional copies, $1 per 100).

In addition to Bite-Wing Films for interproximal examinations, Kodak offers Periapical Films (four types) for the apical areas; Occlusal Film for the occlusal aspects; Blue Brand Film for extraoral studies . . . *an appropriate film for every phase of dental radiography.*

For sharper, brighter radiographs ...the Kodak Film-Chemical Combination

1. Use Kodak X-ray Films—Kodak Bite-Wing . . . Kodak Periapical . . . Kodak Occlusal . . . Kodak Blue Brand. Made to help the dentist know *more*, do *more*. Kept fresh in hermetically sealed foil packages.

2. Use Kodak Concentrated Processing Chemicals—Kodak Concentrated Dental X-ray Developer . . . Kodak Concentrated Dental X-ray Fixer. Tested ingredients, compounded with laboratory care.

So, for best results: Always use Kodak Film and process it in Kodak Chemicals. Remember—order *together* (through your regular dental dealer) . . . use *together* . . . because they are made to work *together*.

Other Kodak X-ray Products for Dentists: Film Chest, Dispenser, Receptacle . . . Exposure Holders . . . Intensifying Screens . . . Safelight Lamps and Filters . . . Processing Tanks . . . Processing Hangers . . . Thermometer . . . Mounts . . . Film Corner Cutter . . . Illuminator.

Eastman Kodak Company
X-RAY DIVISION
Rochester 4, N. Y.

Kodak
TRADE-MARK

dam the blood

WITH

Hemo-pak

TRADE-MARK

Hemostatic Absorbable Surgical Dressings

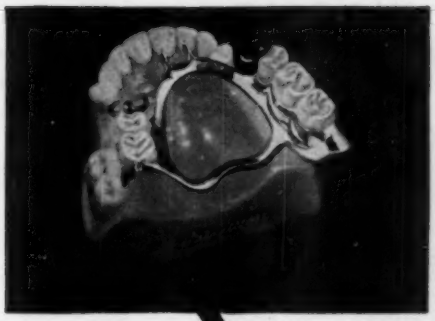
—no additional hemostatic agent required

Prompt control of hemorrhage during exodontia or other oral procedures is now routinely possible by using Hemo-Pak—Johnson & Johnson's dependable new Hemostatic Absorbable Gauze or Cotton Surgical Dressing, prepared from oxidized cellulose. Just remove sterile dressing from tube and press a small amount gently on bleeding surface—nothing else to use, no further attention required. Hemo-Pak is non-irritating. It will be completely absorbed if buried in tissues with no ill effects. Sutures may be placed over Hemo-Pak if indicated. Hemo-Pak is supplied in sterile, sealed tubes.

Hemo-Pak Hemostatic Absorbable Gauze and Cotton are Approved by the Council on Dental Therapeutics of the American Dental Association, and Council on Pharmacy and Chemistry of American Medical Association.

Johnson & Johnson

1. Hemostatic Absorbable Cotton Pads: 6" x 2".
2. Hemostatic Absorbable Gauze Packing: ½" x 2½ yds.
3. Hemostatic Absorbable Gauze Packing: ½" x 5".



it's
ELASTIC LIMIT
88,000 LB./IN²
ELONGATION 12%
to a
testing laboratory

but it means ***Resiliency*** *to you*

To a testing laboratory, Durallium's high degree of resiliency is written merely as "test results: elastic limit 88,000 pounds per square inch, elongation 12%."

To you, the resiliency of Durallium—outstanding chrome-cobalt alloy—means less strain on abutment teeth . . . maintenance of original fit under the stresses of mastication, removal, and reinsertion . . . and the possibility of adjustment without danger of clasp breakage.

Durallium's physical characteristics are such that it withstands the severe tests of the testing laboratory and the vigorous tests of clinical use with equal success.

available through your qualified Durallium laboratory
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RADIOSURG SCALPEL

Indicated as an Aid in Oral Management

*Recently published literature by dental authorities emphasizes the advantages of the new science of minor *electronic* surgery in a wide range of dental techniques. The applications which the dentist will find particularly useful in his practice are:

RADIOSURG SCALPEL—Model R-1

SPOT, MINOR or MAJOR SURGERY
IN PERIODONTIA
INCISIONS
COAGULATION
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THE RADIOSURG SCALPEL is a precision instrument, new in basic principle, and constructed according to exacting specifications. It supplies ideal current characteristics and surgical wave lengths.

WRITE FOR DETAILED DESCRIPTION AND AUTHORITATIVE TECHNIQUES
Accepted by Council on Physical Medicine A.M.A.

ELECTRONIC SURGICAL EQUIPMENT CO., Inc.
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AN APPEAL

If you have overlooked sending in your contribution to the A.D.A. Relief Fund, please put it in the mail today to —

AMERICAN DENTAL ASSOCIATION RELIEF FUND

222 E. Superior Street
Chicago 11, Illinois

TABLETS
BUFFERED
Crystalline
Penicillin G
Potassium

CSC

250,000 UNITS

Prophylactically Following Exodontia

In exodontia, the value of prophylactic penicillin administration to patients with rheumatic heart disease or severe infection is well established. Given before and following extraction, penicillin greatly reduces the incidence of blood-borne infection and minimizes the chances for secondary complications both *in situ* and in distant structures.

Tablets Buffered Penicillin-C.S.C., providing 250,000 units of potassium penicillin G per tablet, are an excellent means of instituting prophylactic therapy. A single tablet 4 to 6 times daily is usually adequate.

The oral administration of penicillin has also been recommended pre- and postoperatively when there is danger of systemic infection following surgery, especially in the case of infected tonsils, periapical abscesses, etc. For this purpose a minimum of 750,000 units should be given during the 24 hours before operation and 500,000 to 1,000,000 units daily in divided doses every 4 hours after operation for 3 or 4 days.

At your prescription pharmacy in boxes of 10 tablets, each tablet individually sealed in foil.

C.S.C. Pharmaceuticals

A DIVISION OF COMMERCIAL SOLVENTS CORPORATION, 17 EAST 42ND STREET, NEW YORK 17, NEW YORK

YEAR AFTER YEAR

THERE ARE GOOD REASONS WHY

- A BETTER ALLOY
- A BETTER TECHNIQUE
- A BETTER PRACTICE BUILDER

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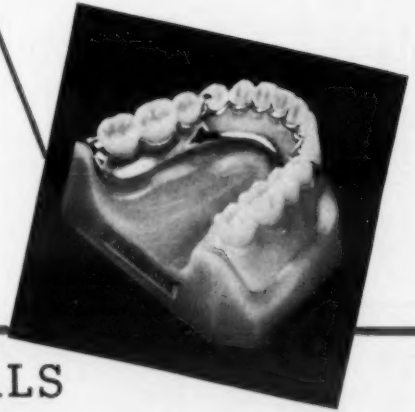

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VITALLIUM PARTIALS

FOR GREATER PATIENT SATISFACTION

LEARN WHY MORE DENTISTS PREFER VITALLIUM REMOVABLES TO ANY OTHER KIND

A-97

CLASSIFIED ADVERTISING

Forms close on 25th of second month preceding month of issue

Remittance Must Accompany Classified Ads.

Advertisements cost $3.50 not exceeding 30 words, additional words 10c each. Commercial agency advertisements, $3.50 for 20 words, additional words 13c each. Publisher reserves the right to determine classification. An extra fee of 25c is charged advertisers who have answers sent care of A.D.A. and in such cases we do not furnish name or address to inquirers. This rate applies for each insertion.

PRACTICES FOR SALE

FOR SALE—Due to death, Florida practice in large city; established twenty years. Excellent location. Complete, modern office, three chairs, air compressor, Castle light and fully equipped laboratory. Price reasonable. Terms. Address A.D.A. Box 95.

•

FOR SALE—Practice and office complete. Excellent modern equipment two years old. Includes SSW motor chair, large American cabinet, Ritter unit and x-ray, etc. Beautiful office and location. Dr. D. L. Kahn, 1575 Beacon St., Brookline, Mass.

•

FOR SALE—Established practice available in Charlotte, Michigan, population 6,000; young dentist moving to Florida. Records included. Excellent location, low rent, reasonably priced. Write Dr. Wm. Clark, Charlotte, Michigan.

•

FOR SALE—Modern, two-chair dental office, one of the best in Topeka. Ritter equipment, air conditioned; air compressor, aspirator. Retiring because of age and ill health, but will stay until acquainted. Can begin work immediately. Write Dr. Kraus, 823 Kansas Ave., Topeka, Kansas.

•

FOR SALE—Exceptional bargain; well established dental office, 529 Market Street, Camden, New Jersey. Reception room furnished in chrome and leather, modern dental equipment, business office furnishings. Address replies to Dr. R. R. Paletz, 350 Lincoln Road, Miami Beach, Florida.

•

FOR SALE—Two-chair office, fully Ritter equipped, including x-ray. Ideal location and floor plan. Leaving to practice in Washington. Dr. Robert J. Stephan, Metals Bank Bldg., Butte, Montana.

•

FOR SALE—Fully equipped, two-chair, modern office and active practice located in Westchester County, N. Y. Established five years in village of 18,000. Leaving to specialize, will sacrifice for immediate sale. Address A.D.A. Box 112.

PRACTICES WANTED

WANTED—Dental practice: Dentist wishes to purchase or become associated in active, well established practice in New York State, Connecticut or Massachusetts. Address replies to A.D.A. Box 106.

WANTED to purchase—established general practice, Pennsylvania or New York. Will consider association with either ultimate ownership or long term contract. 1924 graduate, University of Pennsylvania. Dr. V. Dostrow, 143 E. Roosevelt Blvd., Philadelphia, Pa.

•

WANTED—Dental practice. Desire information on prosperous suburban practice in Ohio city of 50,000 or over. Give details in first letter. Address A.D.A. Box 113.

•

WANTED—Dental practice. Wish to purchase or become associated in active, well-established practice in or around Cedar Rapids, Iowa. Address A.D.A. Box 114.

LOCATIONS AVAILABLE

FOR RENT—in Southern California: space and equipment in a well established, well equipped office, excellent location, to a man of the highest qualifications only. Address A.D.A. Box 107.

•

FOR RENT—Dental office, common waiting room with general practitioner. Ideal location, lucrative practice previously established. Address replies to H. J. Sliski, M. D., 1040 W. Genesee St., Syracuse, N. Y. Phone 3-5370.

•

FOR RENT—Three room professional suite; suitable for dentist or physician; in established physician's office; waiting room furnished. Philip Shulman, M. D., 308 Chestnut St., Roselle, N. J.

•

FOR RENT—Ideal central location in recently built building in Lynn—three rooms with tiled lavatory, x-ray outlets, rubber tiled flooring. Dr. W. Berenson, 32 S. Common, Lynn, Mass.

•

FOR RENT—Three room suite and laboratory, modern, ground floor. Has been dentist's office for 15 years. Ideal location, only one dentist in thriving central Indiana town of 4,000. Address A.D.A. Box 115.

•

FOR RENT—In Tucson, Arizona, five-room dental office plus large reception room in new, modern building shared with medical internist. Rent reasonable. J. J. Gertner, M.D., 3943 E. Broadway, Tucson, Arizona.

OPPORTUNITIES AVAILABLE

WANTED—by philanthropic foundation, dentists under 40 years of age for public health work. Starting salary rate $4,500.00 per annum. Michigan licensure not required, provided the individual is a graduate of an accredited dental school and is licensed in another state. For detailed information write Kenneth R. Gibson, D. D. S., M. S. P. H., Director, Child Health Division, Children's Fund of Michigan, 660 Frederick St., Detroit 2, Michigan.

•

WANTED—Dental intern, beginning July 1, 1950. Training in Anesthesia, Radiography, Oral Surgery, Exodontia, etc. Applicants must be graduates of Accredited Dental Schools. Address Executive Director, Sinai Hospital, Baltimore 5, Md. (Approved by A. D. A. Council on Hospital Service.)

•

MIAMI Valley Hospital, Dayton, Ohio, has opening for a dental intern available immediately. Offers unusual training including experience in anesthesia. Liberal stipend and maintenance. Apply, Dirctor.

•

WANTED—Recent graduate dentist to associate large general practice and build for himself. Double suite in new medical building with ten physicians. Educational center. Pedodontist acceptable. Address A.D.A. Box 116.

SITUATIONS WANTED

YOUNG DENTIST, veteran, five years' experience, desires to purchase established practice, or become association with view to eventual purchase, in Ohio location of over 20,000 population. Address A.D.A. Box 117.

•

YOUNG DENTIST, age 29, graduate of accredited school, wishes position with clinic or established practitioner for general practice. Two years in Navy Dental Corps, two and one-half years private practice. Address A.D.A. Box 118.

EQUIPMENT WANTED

WANTED—American Cabinet, model 141-A, Ritter model B x-ray and Ritter chair. Must be cream white, in good condition and reasonable. Will purchase separately or complete. Address A.D.A. Box 119.

•

WANTED—Large American cabinet, cream white; wall type x-ray, black or cream white. Must be fairly new and in excellent condition. Henry W. Jann, 820 Avenue "D," Rochester, N. Y.

MISCELLANEOUS

WANTED: Old Dental Books—Orthodontia Journals; Old Dental Prints—Advertisements. Leo L. Bruder, 1 De Kalb Avenue, Brooklyn, N. Y.

AGENCIES

When replying to the following advertisements, please direct your letters to Burneice Larson, Medical Bureau, Palmolive Building, Chicago, Illinois.

OPPORTUNITIES AVAILABLE

(a) Young dentist capable of treatment planning in dental problems; diagnostic department, university dental college.

•

(b) General dentist and two pedodontists to become associated with dental department, private practice clinic and hospital; present staff consists of seven dentists; winter resort area, Southwest.

•

(c) Young dentist to become associated with dentist long established in college town of 25,000; early partnership.

•

(d) Oral surgeon to become associated with dentist, well established in Pittsburgh area.

•

(e) Public health dentist to direct dental health program for children; United States dependency; duties include supervising and training native graduate nurses as dental aides; $7000.

•

(f) Young dentists qualified periodontia, prosthodontia, crown and bridge, oral diagnosis, operative dentistry; positions involving dental education and research.

•

(g) Pedodontist to become associated with three dentists; university town of 125,000, Middle West.

•

(h) Public health dentist to direct state program of dental health education; $6600-$7800.

•

(i) Orthodontist to become associated with group clinic; town, 60,000, Texas.

•

(j) Dentist to join department of dentistry, health department, public schools; Indiana.

•

(k) Orthodontist to become associated with orthodontist long established vicinity New York City, partnership possibilities.

•

(l) Pedodontist to become associated with dentist; general practice; university town, Middle West.

•

(m) Dentist, 35-50, interested in relinquishing practice of dentistry for position involving dental product; headquarters, western city.

•

(n) Public health dentist to direct program for children enrolled in public schools; university town, Southeast.

•

(o) Dentist interested in institutional work; fairly large hospital; New York state.

•

(p) Pedodontist and, also, outstanding operator in general operative procedures; group appointments; California.

•

(q) Dentist; group appointment; general practice with emphasis on crown and bridge, pedodontics; Ohio.

•

(r) Instructor in clinical and operative dentistry and, also, instructors for staff of full and partial dentures; university college of dentistry.

(a) Dentist, to become associated with dental department, large industrial organization; vicinity Washington, D. C.

TECHNICAL ASSISTANTS

(a) Hygienist to become associated with two dentists; college town, Pacific Northwest; $300, plus percentage.

•

(b) Hygienist qualified in teaching, school for hygienists being established by state university.

•

(c) Dental x-ray technician qualified to direct department and, also, two hygienists; department staffed by seven dentists, unit of private practice group operating own hospital; winter resort area, Southwest.

•

(d) Hygienist to become associated with dentist; residental town, Pennsylvania.

•

(e) Hygienist; dental group well established in California.

SITUATIONS WANTED

Note: For further information concerning the following advertisements, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago, Ill.

•

Dentist seeks association in general practice of dentistry; D.D.S., Middle Western university; internship eastern hospital; year's graduate course, minor oral surgery.

Dentist with twelve years' experience in practice of general dentistry and exodontia with gas-oxygen anesthesia seeks opportunity of executive nature; teaching experience.

•

Young oral surgeon; year's residency in oral surgery, large hospital; three years' residency and training, department of oral surgery, state university; has fulfilled all formal requirements for American Board.

•

Dentist with fourteen years' experience in practice limited to orthodontia and pedodontia; two-year internship, Eastman Dental Dispensary; three years' graduate training in orthodontia.

•

Dentist; B.S., D.D.S., M.S., state university now working on Ph.D. degree; particularly interested in opportunity involving periodontia; interested teaching, research, public health administration.

•

Dentist qualified public health and children's dentistry; B.A., D.D.S., M.A., Ph.D., leading schools; year's residency, children's dentistry; teaching experience; research has been particularly concerned with administrative and educational problems in connection with children's dental programs in under-developed areas.

•

Young dentist now completing graduate work in prosthetic dentistry leading to Master's of Science degree; several years' successful private practice before specializing.

"ORACAM"*—A Complete Photographic Dental Set-Up

UTILIZING YOUR OWN 35mm CAMERA to take Dental Pictures in natural color or black and white. (If you wish, we can supply the camera, also)

Simply set the unit on your Bracket Table, adjust the camera for the area you wish to photograph, remove the simple-to-use corrector rod, and SNAP THE PICTURE.

FOR ALL MAKES AND MODELS OF 35mm CAMERAS. ORDER TODAY!

TAKE ADVANTAGE OF THIS NEW LOW PRICE . . . . . Complete with Bulbs, only **$49.50** PREPAID

*Pat. Applied for

Complete with Camera as Displayed—$79.50

SOUTH SHORE CAMERA CO.

1927 E. 71st St. Chicago 49, Ill.

Butterfield 8-8311

See this unit while in Chicago for the Chicago Dental Society Midwinter meeting—February 6-9

A superb impression material for non-pressure or pressure technic

The ONLY elastic impression material specifically compounded for full denture impressions and also widely used with great success for bridge and indirect inlay impressions.

DP three-in-one cream Offers You These Important Advantages:

Flows without pressure against tissue at rest and does not adhere to dry tissue.

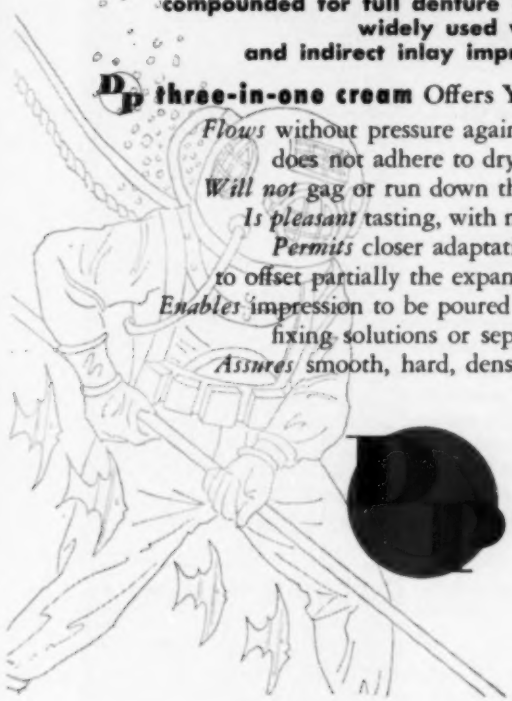
Will not gag or run down throat. *Is clean* to use; not messy.

Is pleasant tasting, with no burn. *Does not* dehydrate tissue.

Permits closer adaptation, because it is compounded to offset partially the expansion of stone cast.

Enables impression to be poured immediately without fixing solutions or separating medium.

Assures smooth, hard, dense casts in all instances.



Order Three-In-One Cream from your Dental Dealer soon

DENTAL PERFECTION CO.

543 West Arden Ave., Glendale 3, Calif.

What has a Cal-Lab got for you that other labs haven't got ?

Your local CAL-LAB is an active member of the "Certified" laboratory group serving many thousands of professional men in more than a hundred cities from coast to coast. Your Cal-Lab has available at all times the vast fund of knowledge and experience originating in each of these laboratories. It's the old principle of "two heads are better than one" multiplied a hundredfold!

By entrusting your restorations to the Cal-Lab near your office you get the *personal* service of a single laboratory *plus the valuable experience of ALL Cal-Labs.* You get full and partial dentures that are processed with nation-wide knowhow, with the latest techniques, finest precision equipment, tested materials. You get what your CAL-LAB has got—the highest standards of the profession. For *better* dentures, for *dependable* service, call your CAL-LAB today.

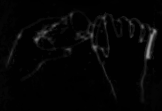
the **CAL-LAB** Group

Do you read CAL magazine?

Ask your CAL-LAB to send it to you!

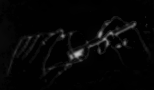
Recommend the INGRAM THREE-STEP ROUTINE:

1



Tilt a clean glass tumbler and pour ½ teaspoonful of powder on the inside curved surface.

2



Moisten toothbrush, dip it into powder and brush all surfaces of the teeth and gum margins.

3

Pour water on remaining powder in glass until one third full. Mix, use as rinse, retaining in mouth for full minute. Do not follow with clear water or other rinse.

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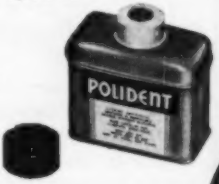

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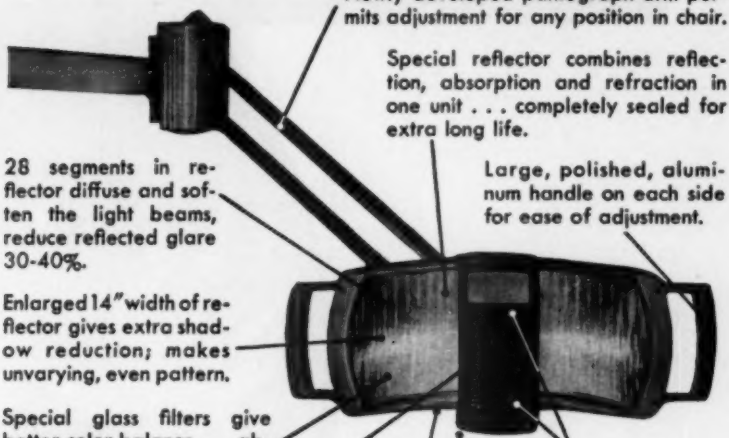

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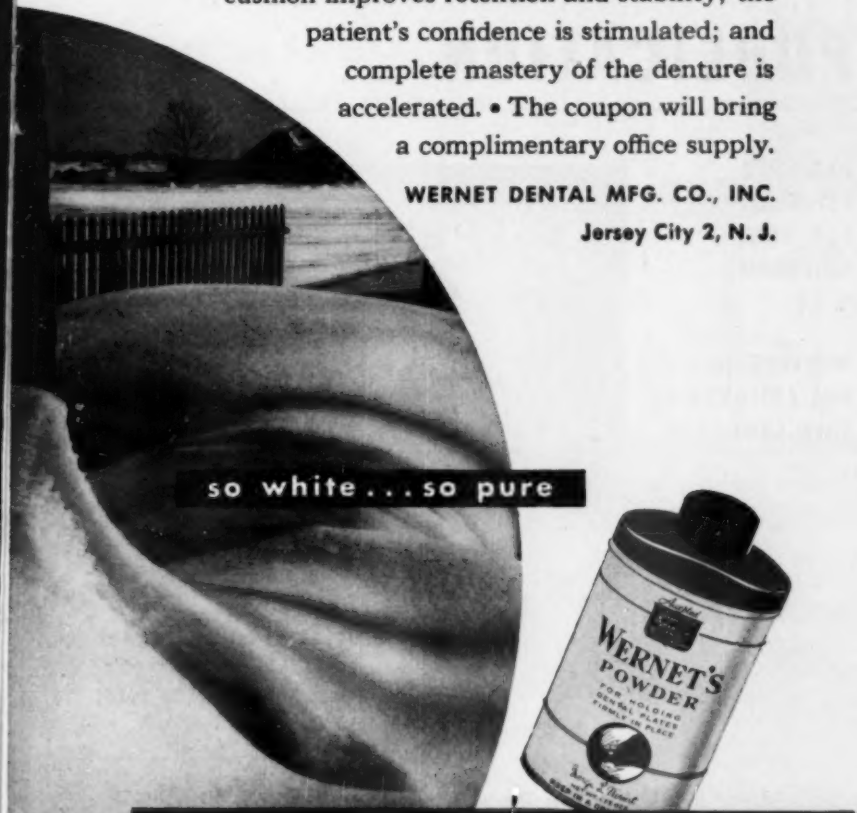

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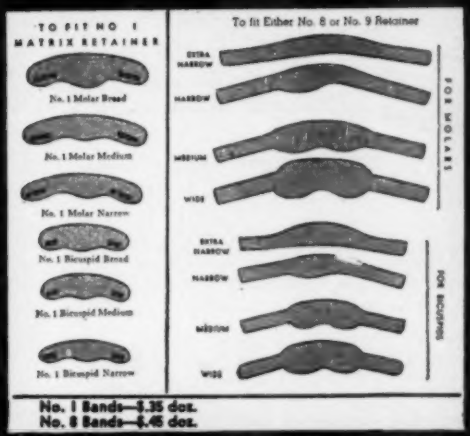

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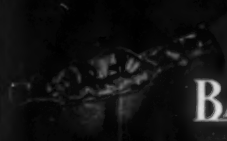

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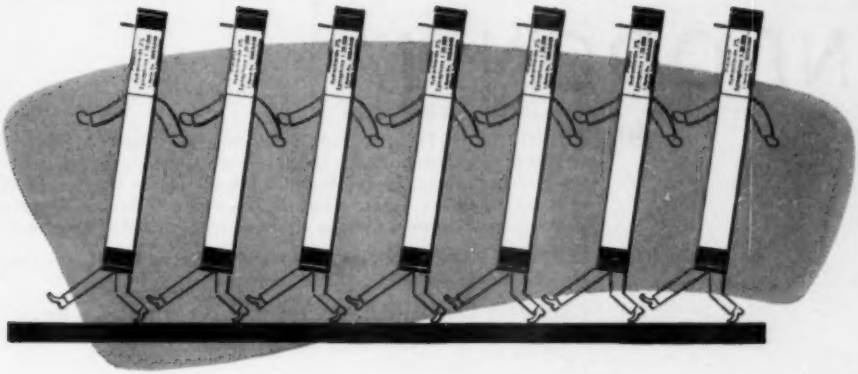

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